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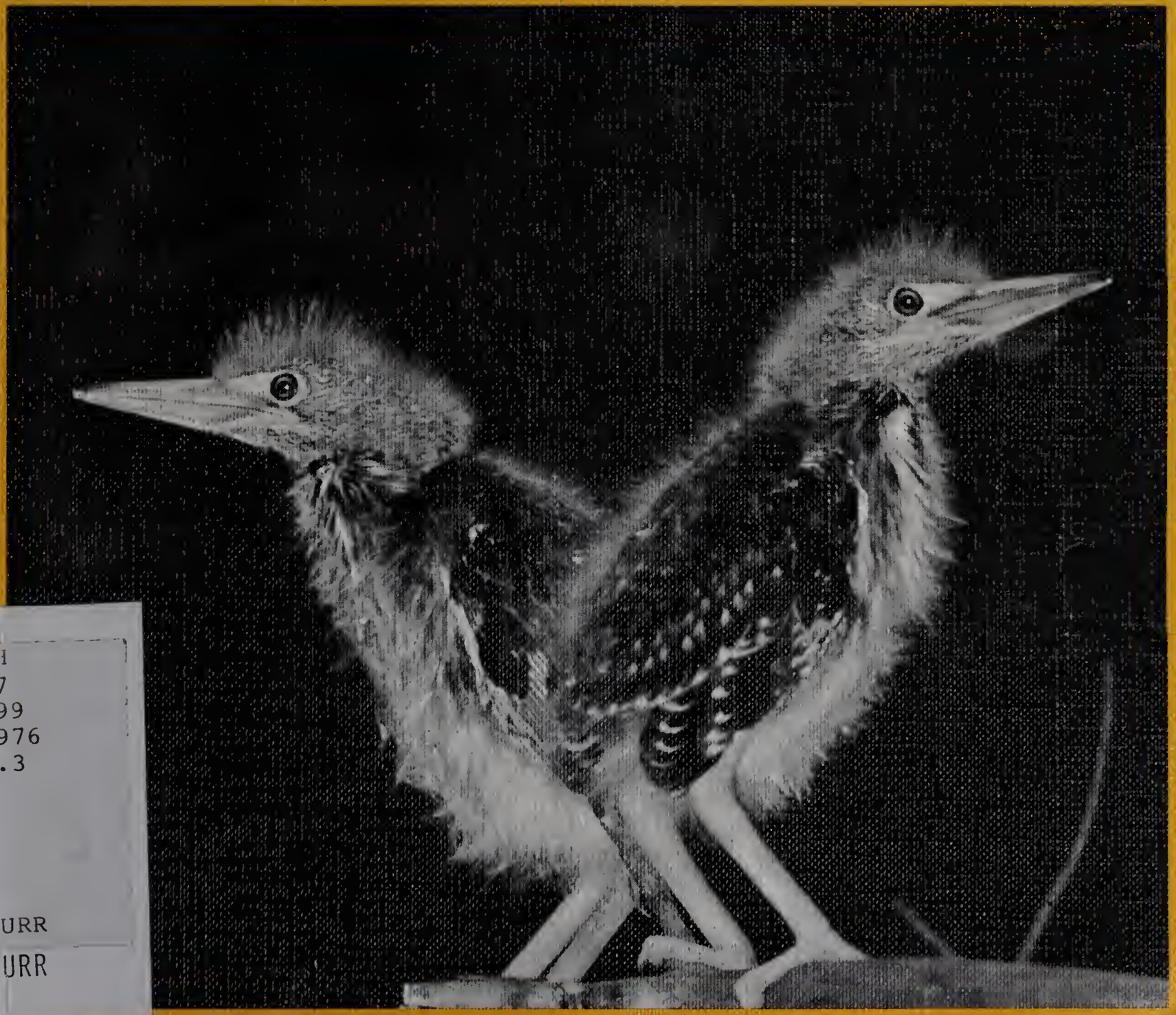
Studying Birds

METRIC EDITION

Audrey Wilson



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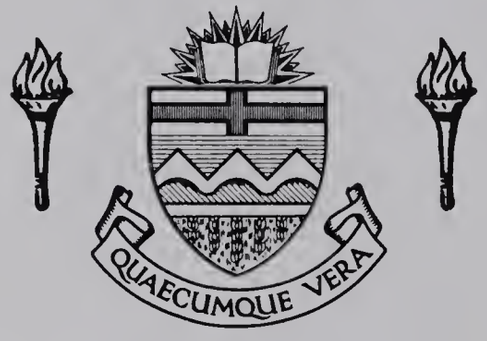


Studying Birds

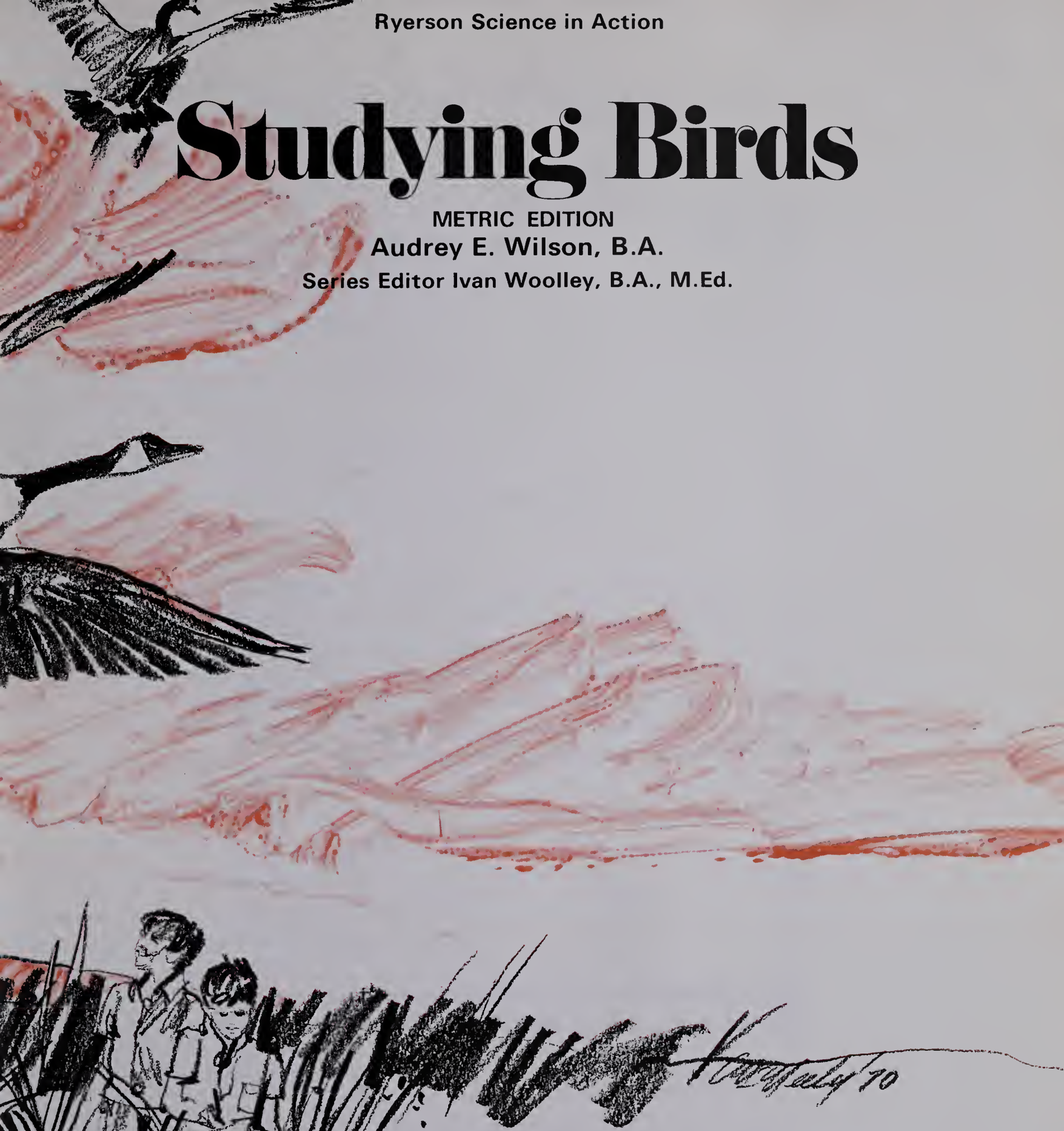
Ryerson Science in Action

Studying Birds

METRIC EDITION

Audrey E. Wilson, B.A.

Series Editor Ivan Woolley, B.A., M.Ed.



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A.E.W.

Miss Wilson, an expert naturalist and nature photographer, is an outdoor education consultant.

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TO THE TEACHER

Studying Birds, which complements *Studies for Open Places* and *Studies for Woodlands*, is a very flexible book. As "birds" is not a tangible subject and is intended for use by pupils particularly interested in doing activities, one section of the book does not necessarily depend on the foregoing section and may therefore be applied in many varying class, group or individual situations. One pupil may be interested in bird recognition, while another will be concerned with bird photography or the building of feeders and homes. Each is a valid starting point. The activities, which are aimed at approximately 8 to 14 year olds, generally involve outside studies followed by indoor projects.

At all times, guide pupils to respect and protect birds from a conservation viewpoint. In particular, during the nesting season many teachers are beset with the problem of children bringing nestlings to the classroom. Frequently the children think that these young birds are orphaned, as no adult bird can be seen nearby and the nestling is off by itself. Caution your class in advance that it is natural for many young birds to spend from several days to several weeks on or near the ground after leaving the nest. Under no circumstances should the young be removed, as the parent bird will be present, though seldom seen. The young birds depend on the adults for food. Chances for survival are greater if the normal chain of events is allowed to happen, instead of a human taking on the arduous task of being a substitute parent. Class discussions regarding the too-frequent sad results of taking on such responsibilities will help to alleviate this problem.

Note also that migratory birds are protected by the Migratory Birds Convention Act. Only persons holding a valid permit are allowed to capture and keep them.

TO THE PUPIL

This book introduces you to many of the ways of birds. You will realize that a bird's life is full of dangers, and *Studying Birds* gives many suggestions on how to help and understand them.

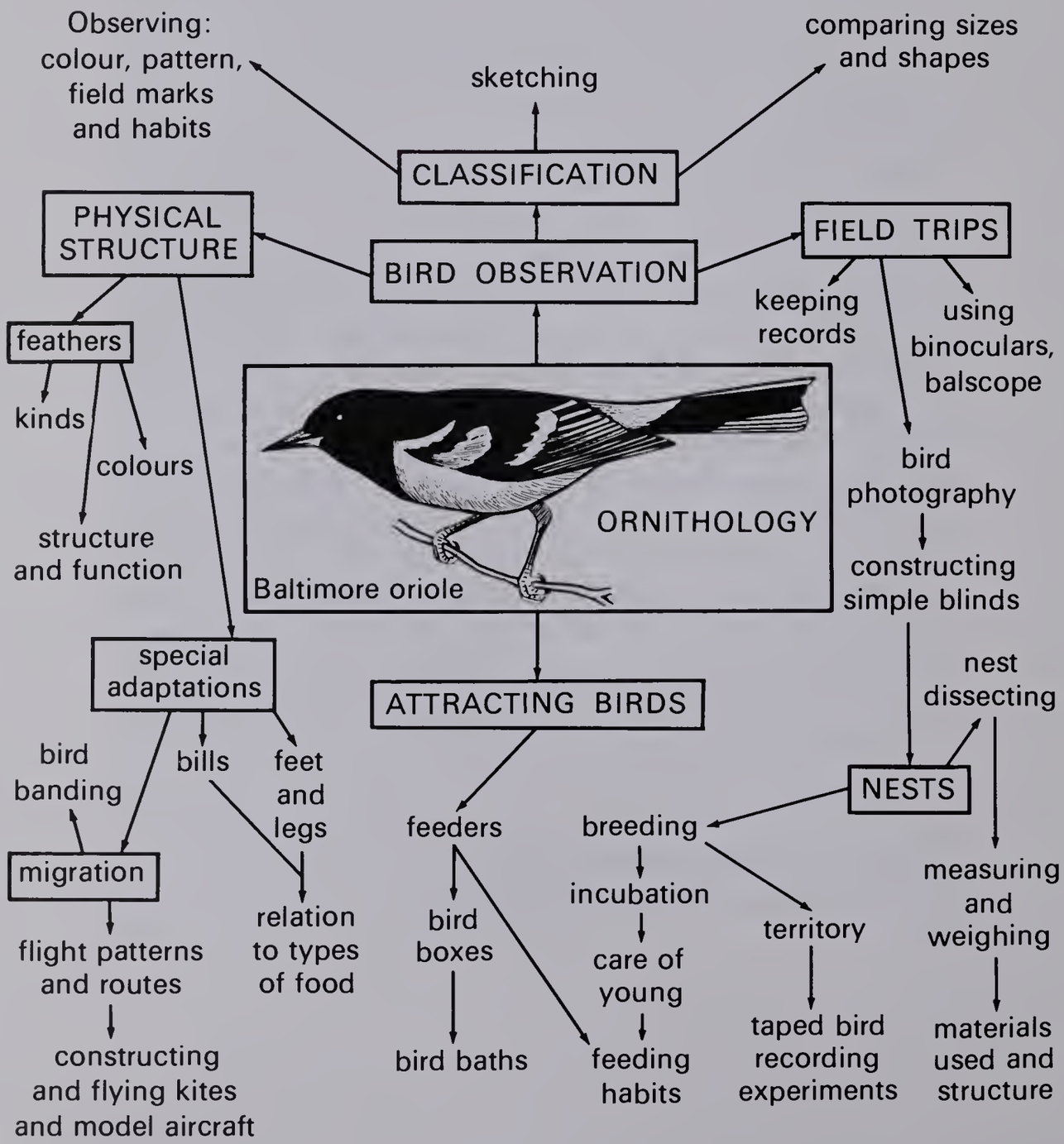
In your studies, always respect birds. Here are a few hints.

1. Protect nests during the breeding season. *Never* handle eggs or young birds. Observe from a distance with binoculars, or maybe from a blind. Avoid trampling a path to a ground nest as this will attract animal predators, who may destroy the contents.
2. After leaving the nest, many young birds spend from a few days to several weeks on or near the ground. During this time they depend on the adults for food. If you find a young bird, observe it from a distance, but *do not* take it away. The parent bird is seldom seen but is nearly always present. Also, it is very difficult for you to duplicate the diet of a young bird.
3. Never keep a wild bird caged unless you have a special holding permit. Injured birds should be kept only until they are well enough to leave. Use a box or cage that is safe from cats. Supply water and food, seeds for seed-eating birds, and meat for insectivorous birds. Chopped worms or dog meat mixed with water and fed from the end of a matchstick will help. Do not handle the bird more than necessary. It will remain quiet if a towel is used to darken the container.
4. When observing birds at close range (for instance at feeders and nest boxes) do not move suddenly. Learn to stalk birds slowly. A car is a good blind for getting close to shore birds or ducks.
5. It can be fun to hunt with a camera. Leave nest photography to the advanced photographer.
6. Remember the rules of conservation.

Chapter 1

INTRODUCTION TO ORNITHOLOGY

The study of birds, known as ornithology (or-ni-thol'o-ji), is popular throughout the world. Look at the following flow chart to see a few of the many avenues of interests or activities that can result from this hobby.



BIRD OBSERVATION

The "S" System for Easy Bird Watching

What is a bird?

At first this question appears to be silly. The following definitions were given in Miss Moon's class. Compare them with your definitions.

1. *"A bird is something that flies".* Why is this definition only partly true? Consider bats, flying squirrels, many insects, airplanes and perhaps even flying saucers.
2. *"A bird is an animal with feathers and it flies".* Do ostriches, penguins, nestlings and dead birds fit this category? Why?
3. *"Birds are creatures that have a body covering of feathers".* The class accepted this definition. Will you agree with it, at least for the present time?

   Many different approaches to bird observation are in use. The "S" system of bird observation is one aid or key to easier bird recognition. Six key words, all beginning with the letter "S", give the steps in this method.

1. SIZE

Three standards are in common use for comparisons. Observe these particular birds and become very familiar with their size.

sparrow size
13 cm tail to beak

robin size 21 cm

crow size 43 cm

These drawings are about a seventh of the actual size. Usually it is impossible to take a ruler and measure a bird; learn to estimate the size. Comparing the size of the unknown bird to that of common ones such as sparrow, robin and crow is helpful. This is known as finding a *relative size*. Some birds may be smaller than a sparrow. Most hummingbirds are about 7.5 cm in length so they are said to be smaller than a sparrow. Similarly some birds, such as a Canada goose, may be larger than a crow. Name two others. Frequently the length of tail, bill, legs and wings will give a clue to the correct bird family.

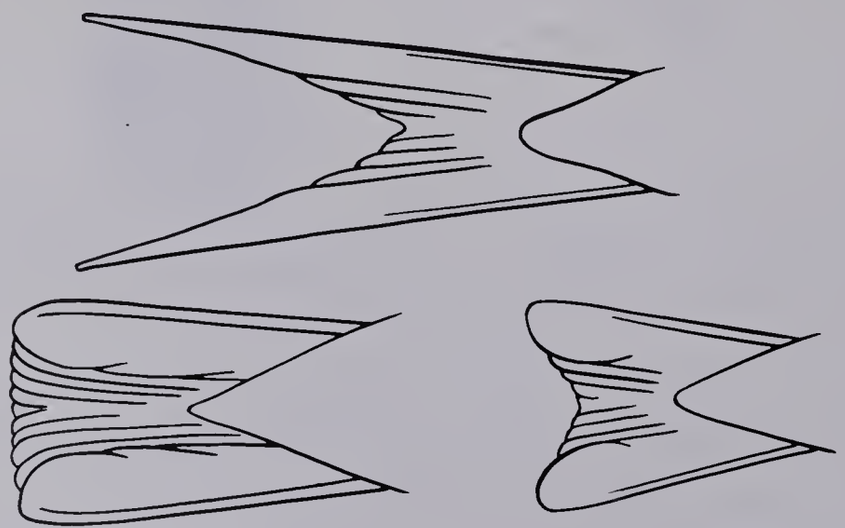
2. SHAPE

General Body Shapes. Four shapes are in common use for comparisons. Find pictures and observe live birds to become familiar with these shapes.

(a) *Bills.* Close observation of the shapes of bills indicates what birds eat. Note the shape of the bills in the drawing. Suggest why each bird has this type of bill.

(b) *Head Shapes.* These are important in identifying certain family groupings of birds. Owls usually have a roundish head. In comparison, describe the shape of a duck's head.

(c) *Tail Shapes.* These help to tell apart different species within a family grouping, for example the swallow family.



Barn swallow—deeply forked tail
Cliff swallow—square tail
Tree, rough-winged, bank swallows and martins—notched tails

(d) *Wing and Tail Shapes.* These and tail length help us to tell three basic types of hawks.

Falcons—long, pointed wings with a long tapering tail.
Accipiters—short, rounded wings with a long tail.
Buteos—broad wings with a broad, rounded tail.
Which of these groups of hawks is best suited for high speeds because of its streamlined appearance? Which type will be best for soaring on air currents? Why?

3. SIGHT

This is a third way to approach bird recognition. This is everything observed with your own eyes. Keeping the relative size of a bird and its overall shape in mind, now look at colours and patterns.

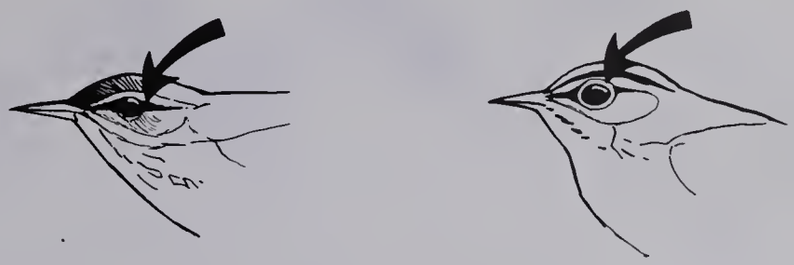
(a) *Colour.* Many birds have one main colour. Which colour is most apparent in the cardinal, indigo bunting and yellow warbler?

Andrew and Mark found coloured pictures of birds in the library and made a chart to illustrate this point. Perhaps someone in your class could complete a similar chart showing the main colours of birds sighted.

Main Colour	Bird
red	cardinal
black	crow, starling, grackle
blue	blue jay, indigo bunting

(b) *Pattern.* Other birds have definite colour patterns. The scarlet tanager is a red bird with black wings and tail. Describe the colour pattern of these birds: wood thrush, bluebird and goldfinch.

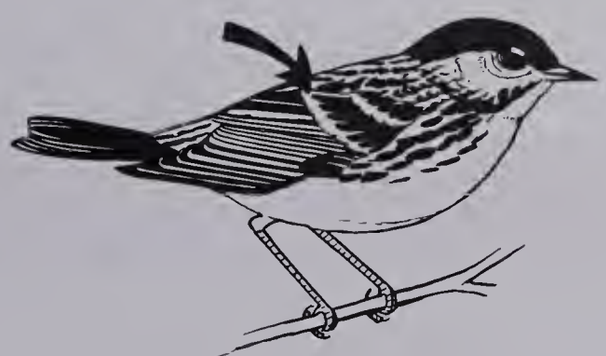
(c) *Special Markings.* Characteristic markings help in observing birds. These are known as "field marks". Does the bird have an eye stripe or an eye ring?



Does the bird's head have a crest, crown patch or crown stripes?

Is the breast striped, spotted or unmarked?

How many wing-bars are there?



(d) Does the tail have

outer white tail feathers, | white tail tips, | tail band, or | coloured rump patch?

(e) *Special Habits.* Many birds perform certain activities regularly. Canada geese are famous for their special flight formation. Describe this formation.

Does the bird have an undulating (up and down) flight like the goldfinch?

Does the bird "teeter" or "bob" like a spotted sandpiper?

Most members of the flycatcher family are very similar in appearance.

Which flycatcher has the habit of wagging its tail while perched?

Sight also includes overall colour, pattern, special field markings and characteristic habits of birds.

4. SOUND

This refers to every noise that birds make. Many birds call their own names. Miss Murphy's class started this list.
How many can you add?

Birds That Call Their Name
1 killdeer
2 bob-white
3 phoebe
4
5

Bird recordings will help you to pick out typical bird songs and call notes. Many birds have a characteristic sound. Make a chart and match these sounds with the correct bird.

BIRD	SOUND
swallow	tap
woodpecker	drum
kingfisher	twitter
hawk	rattle
grouse	hoot
owl	scream

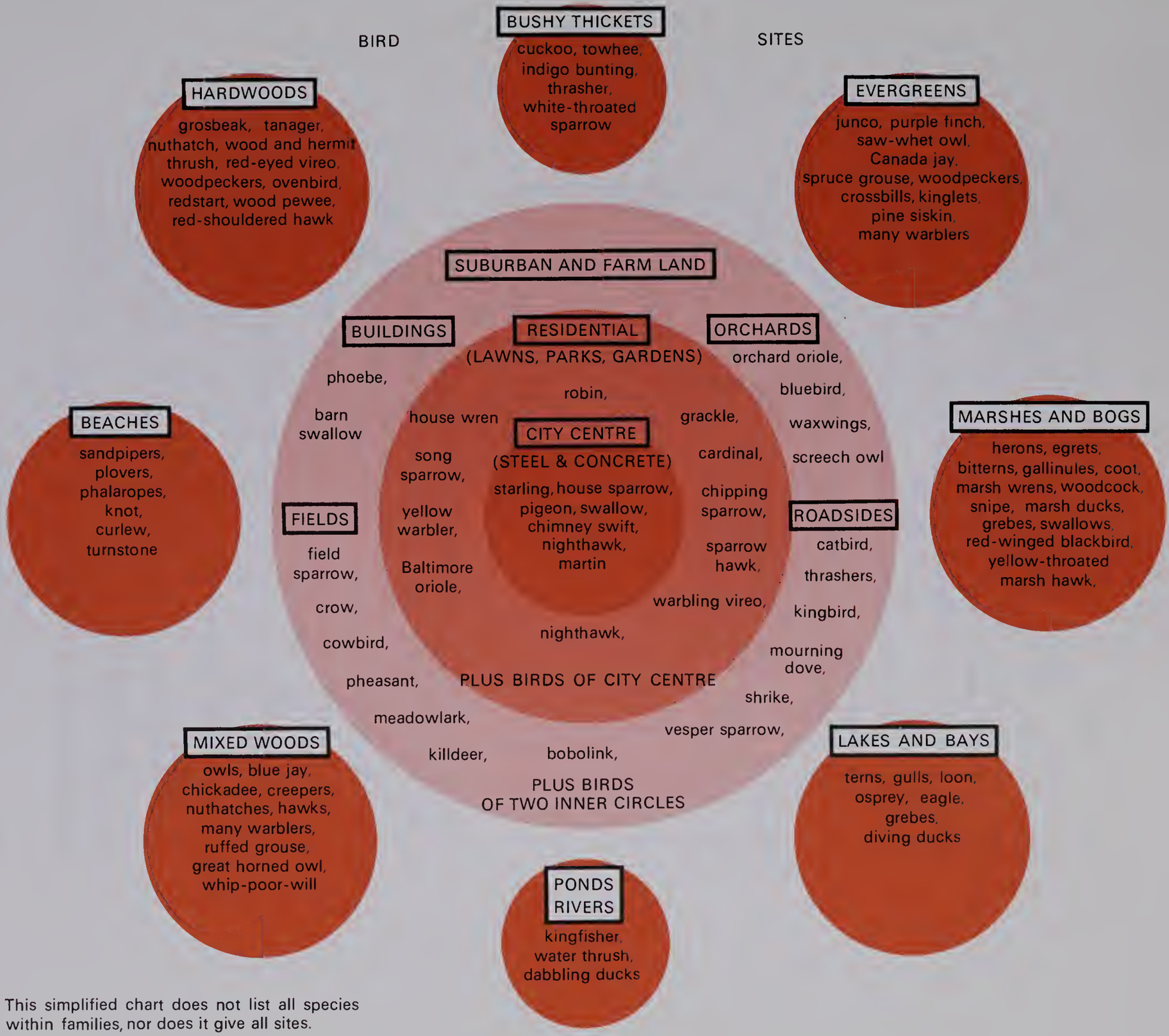
5. SITE

Each bird has its own particular habitat (home) where it spends most of the time. This area will contain the right kind of food for each type of bird. Just as a miner lives in a mining area and a fisherman near the sea, so each bird selects its own special place to live. From direct observation or your research, match these birds to the site most suitable for their food requirements.

BIRD	SITE
robin	woods
redwinged blackbird	pasture field
mallard duck	stream
killdeer	marsh
kingfisher	pond
browncreeper	around homes
meadowlark	plowed field

On a bird hike, visit a large variety of sites to record a good list of different birds. Study the bullseye on page 21 for ideas on specific birds you can expect to find in various habitats.

BIRD SITES


BUSHY THICKETS
cuckoo, towhee, indigo bunting, thrasher, white-throated sparrow
HARDWOODS
grosbeak, tanager, nuthatch, wood and hermit thrush, red-eyed vireo, woodpeckers, ovenbird, redstart, wood pewee, red-shouldered hawk
EVERGREENS
junco, purple finch, saw-whet owl, Canada jay, spruce grouse, woodpeckers, crossbills, kinglets, pine siskin, many warblers
SUBURBAN AND FARM LAND
BUILDINGS
phoebe, barn swallow
RESIDENTIAL
(LAWNS, PARKS, GARDENS)
robin, house wren, song sparrow, yellow warbler, Baltimore oriole, field sparrow, crow, cowbird, pheasant, meadowlark, killdeer
CITY CENTRE
(STEEL & CONCRETE)
starling, house sparrow, pigeon, swallow, chimney swift, nighthawk, martin
nighthawk, warbling vireo
PLUS BIRDS OF CITY CENTRE
bobolink, vesper sparrow, shrike, mourning dove, kingbird, thrashers, catbird, sparrow hawk, chipping sparrow, cardinal, grackle, waxwings, screech owl, bluebird, orchard oriole,
ORCHARDS
ROADSIDES
FIELDS
PLUS BIRDS OF TWO INNER CIRCLES
BEACHES
sandpipers, plovers, phalaropes, knot, curlew, turnstone
MARSHES AND BOGS
herons, egrets, bitterns, gallinules, coot, marsh wrens, woodcock, snipe, marsh ducks, grebes, swallows, red-winged blackbird, yellow-throated marsh hawk,
MIXED WOODS
owls, blue jay, chickadee, creepers, nuthatches, hawks, many warblers, ruffed grouse, great horned owl, whip-poor-will
LAKES AND BAYS
terns, gulls, loon, osprey, eagle, grebes, diving ducks
PONDS
RIVERS
kingfisher, water thrush, dabbling ducks

This simplified chart does not list all species within families, nor does it give all sites.

6. SEASON

It is very useful to know the season in which to expect certain birds. Their presence will depend upon geographic location and climate. Birds may be divided into three main categories.

Resident: those that are present all year.

Breeder: those that breed in the summer and may or may not stay in winter.

Migrant: those that return in the spring and leave in the fall. (See chapter 3.)

For each of the above categories, make a list for your area.

	RESIDENT BIRDS	BREEDING BIRDS	MIGRANT BIRDS
1 2 3 4 5 6			

Perhaps the list will help answer these questions.

(a) Why are some birds suited to stay all year round?

(b) Does size have any bearing on which birds are winter residents?

(c) Why can some birds stay over the winter months?

(d) When do most migrating birds arrive?

(e) Compare the diets of resident and migratory birds.

(f) Explain why some birds need to go to a warmer climate for the colder months.

(g) Find out if migrant birds always use the same flyways during spring and fall. An interesting example is the golden plover.

Use the "S" System as a guide and develop a chart to aid you to observe birds in the field.

RESULTS OF GROUP 1

SIZE	SHAPE	SIGHT	SOUND	SITE	SEASON date	BIRD?
robin sized	chunky	mostly red. crest	"Peter Peter"	top of evergreen	March 6 19--	cardinal
robin sized	chunky	all black. short tail. yellow beak.	seems to mimic many birds	in school yard	March 12 19--	starling
sparrow sized	slender	blue-black back. orange breast. forked tail.	twitter	barn-yard	May 25 19--	barn swallow

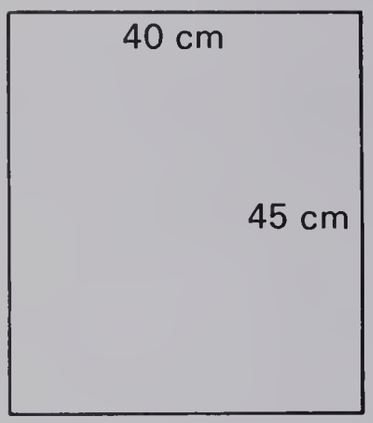
RESULTS OF GROUP 2

This group used symbols for part of their chart.

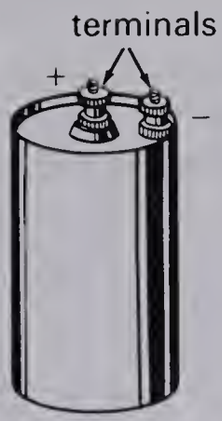
	BIRD 1	2	3	4	SIZE KEY
SIZE	▬	▬			• sparrow
SHAPE	||	||			▬ robin
SIGHT	mostly red				■ crow
SOUND	"Peter Peter"	mimic			SHAPE: slender |
SITE		school-yard			chunky ||
SEASON	March 6	March 12			plump |||
BIRD?	cardinal	starling			bulky |||

Electric Game Board

MATERIALS



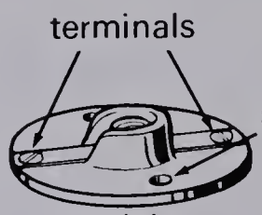
wall board



#6 dry cell

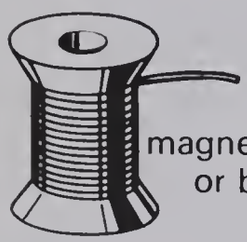
flashlight bulb

2 small screws



porcelain or
plastic socket

0.3 cm drill


magnet wire #22
or bell wire

Tools

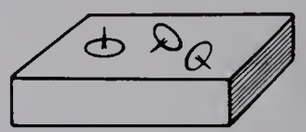
screwdriver

pencil

ruler

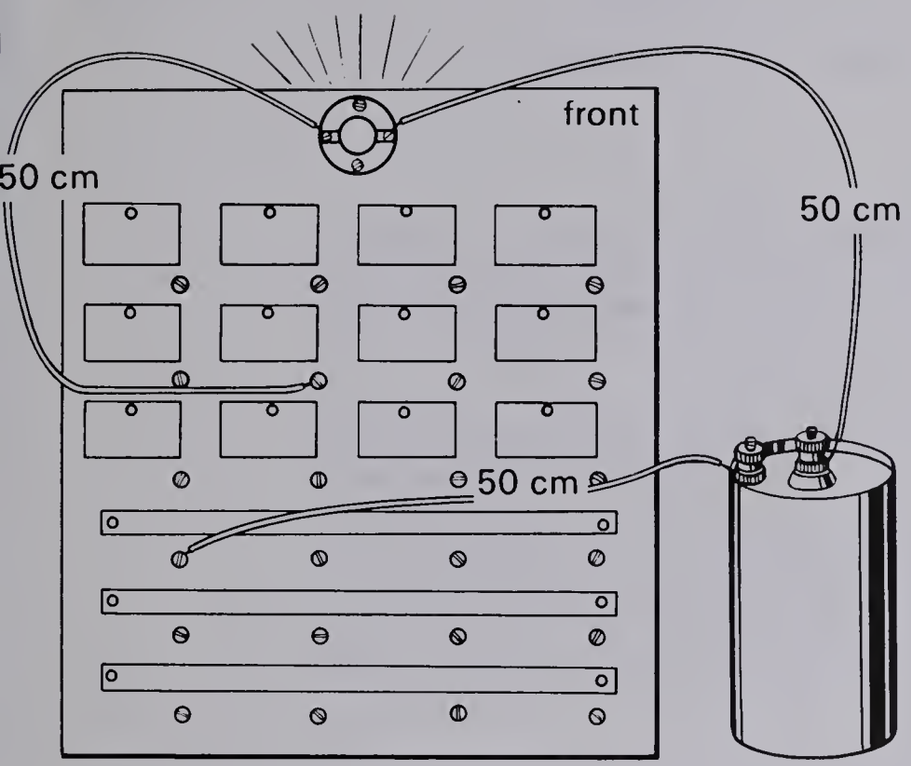
knife

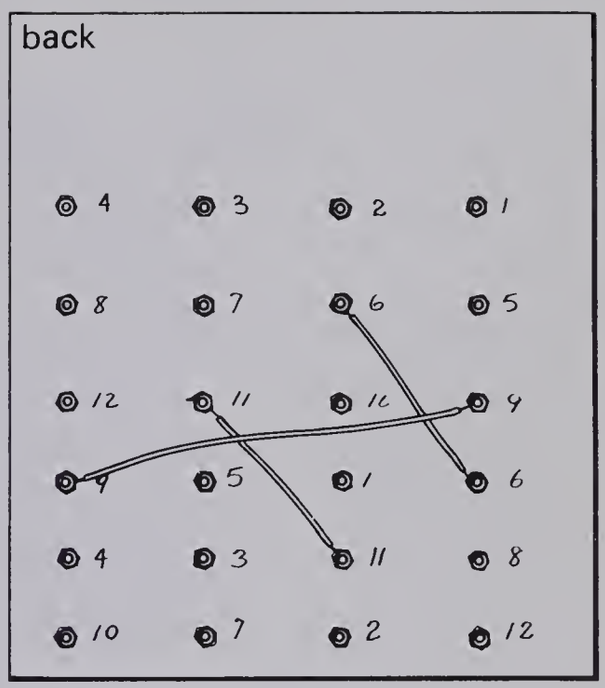
24 0.3 cm bolts
and nuts


thumb tacks

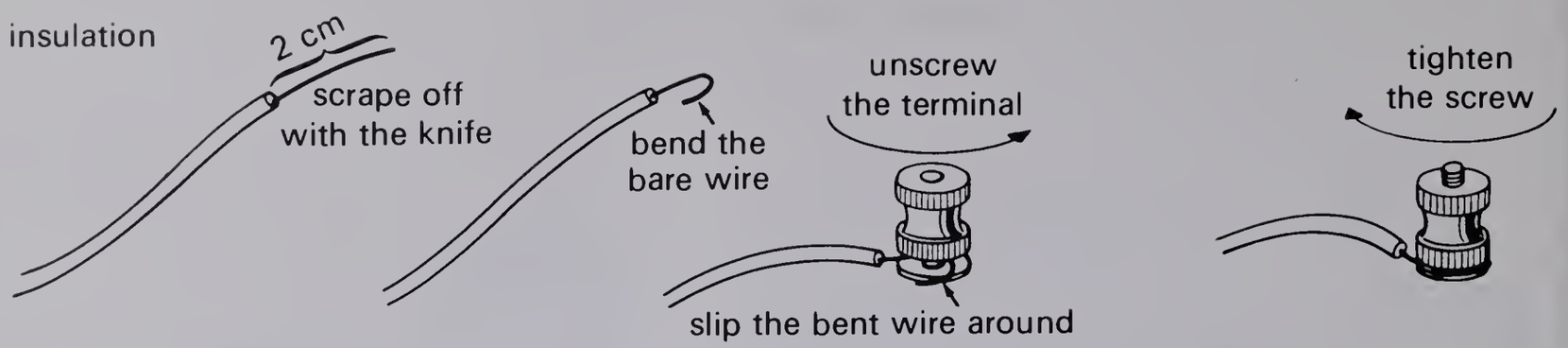
METHOD

1. Using the small screws, fasten the light socket to the board.
2. Drill six rows of evenly spaced holes. Measure and mark the places with a ruler.
3. Connect two 50 cm pieces of wire, as shown.
4. Thumb-tack .12 bird cards to the top of board, as shown.
5. Next, thumb-tack name strips above the bottom three rows of bolts.



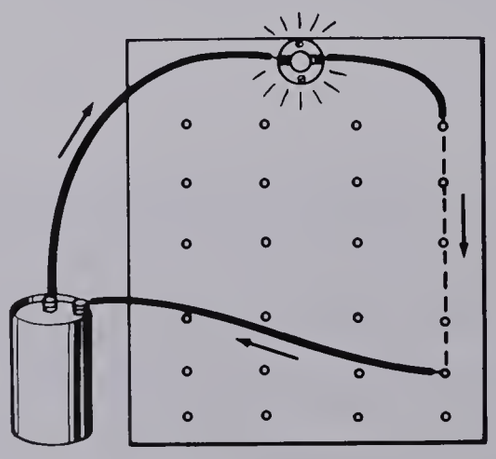


6. On the back of the board, number the bolts of the pictures from #1 to 12 in pencil. Number the answer bolts, putting #1 next to the bolt which matches picture #1. See the illustration. Using short pieces of insulated wire, connect the numbered bolts, 1 to 1, 2 to 2, and so on. Wires have to be crossed, so be certain the insulation is not torn or thin. You may wish to scramble the order and work out your own number series.



HOW TO OPERATE

1. To use your game board, touch one wire from the light to a picture bolt, and the other wire from the light to a name bolt. When the correct answer bolt is touched, the light will shine.
2. Your class may wish to substitute either the picture cards or name cards with "S" system cards. Each pupil prepares a small typed card with clues from the "S" key. Touch the wire from the light to this "S" card bolt, and the other wire from the light to either the matching picture card bolt or name card bolt to complete the circuit. The right answer completes the circuit.



Down the road
they are blasting
a new site

a lumber-truck
crashes by

still
I can hear
the chipping-sparrow

Joan Finnigan

Chapter 2

ADAPTATIONS

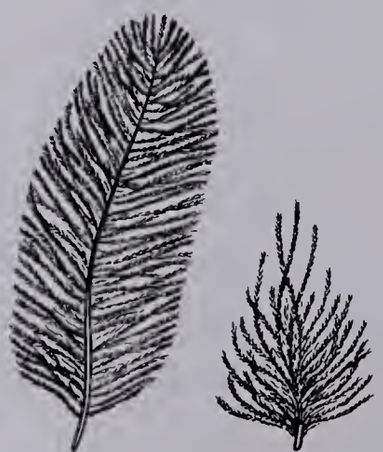
FEATHERS

Kinds of Feathers

Of all living things in the Animal Kingdom, birds and *only* birds have feathers. Feathers are of four main kinds. Collect as many different ones as possible. Group these according to the uses listed below.

1. *Contour feathers.* These are the most numerous. They give a bird its streamlined shape or *contour*.

2. *Down feathers.* These soft feathers lie under the contour feathers. Ducks and geese have a complete layer of this "underwear", which acts as *insulation* against cold and heat.

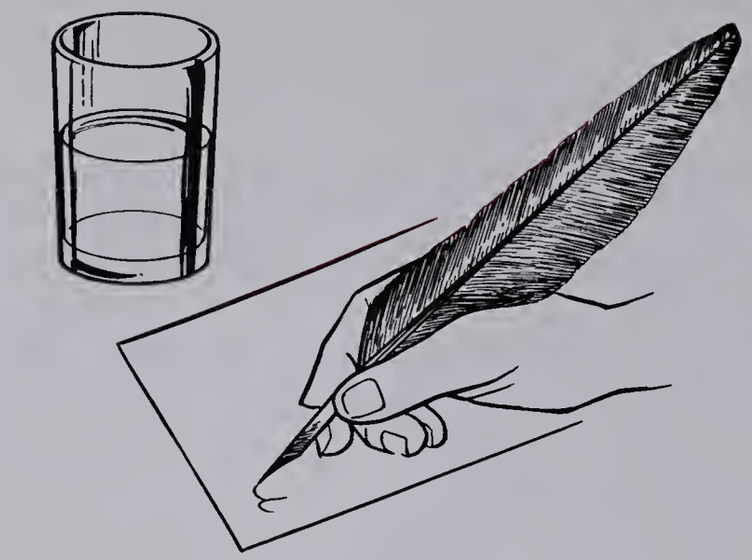


3. *Filoplumes*. Have you ever helped to pluck a fowl? Filoplumes are the long hair-like feathers that are singed or burned from the fowl. Sometimes they stick out from the coat as *decoration*. Name a bird that has this type of decoration.

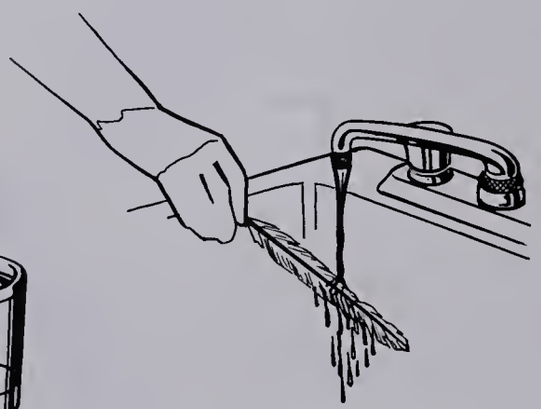
4. *Flight feathers.* These stiff, long quills are found on the wings and tails for *flight* purposes.

These drawings of feathers are not to scale. The down feathers and filoplumes have been enlarged so that detail may be seen.

Things to Do



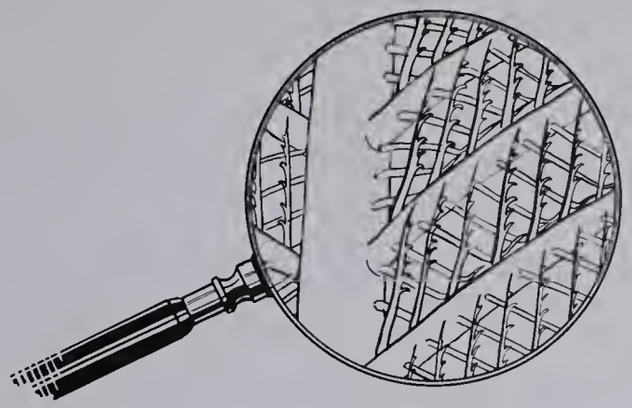
submerge feather in a glass filled with water



hold feather under running tap water

Take a large flight feather and cut off the end of the quill. What do you find? Why is this important for a creature that flies? In pioneer days quills were used as pens. Make a quill pen. Use it to answer the questions in this section. Experiment with various juices for inks.

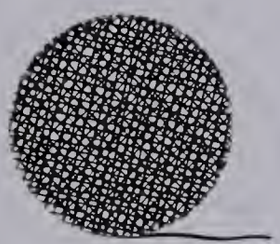
Test each of the groups of feathers to find which are the most waterproof. Try these methods.



Place each type of feather under a magnifying glass or microscope. Look for the tiny hooks and barbs. Sketch the type of feather that shows this feature best. Separate the barbs; zipper them together again by running them through the fingers as a bird would preen with its beak.

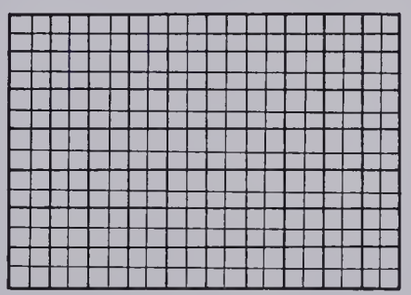
Protective Colouring (Camouflage)

MATERIALS

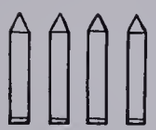


ball of cord

4 stakes

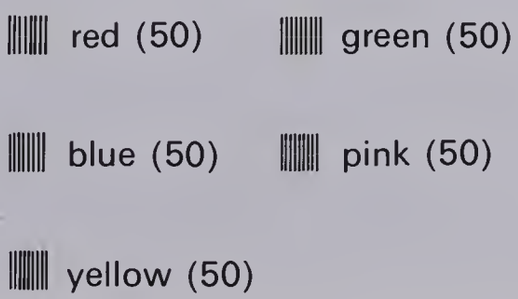


graph paper



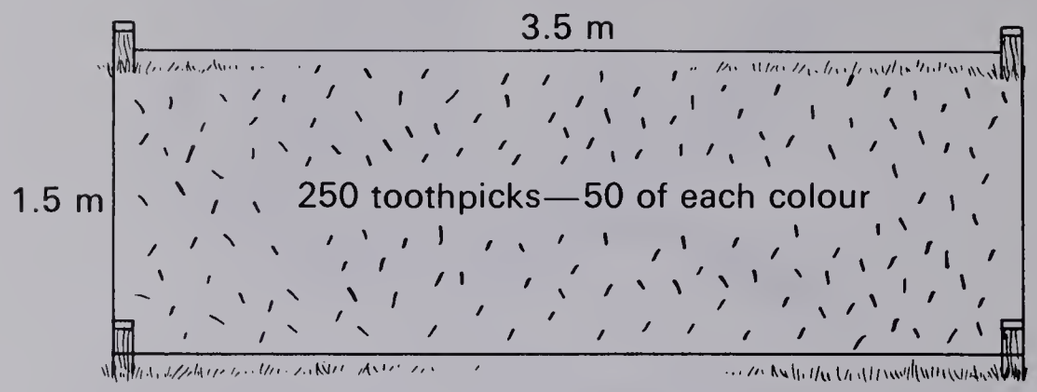
crayons

coloured toothpicks



METHOD

1. Use stakes as corner pegs to form a rectangular garden plot as shown.



2. Push 250 toothpicks of five different colours into the garden plot. Make certain that the colours are well distributed over the area. To avoid breakage, shove each toothpick into the ground at a slight angle. About half an inch of the toothpick should be left showing.
3. Imagine that the class are "toothpick birds". Toothpick birds eat toothpick worms, which are the coloured toothpicks. Gather round the garden's perimeter. When the starting signal is given, each pupil or "toothpick bird" pulls out as many toothpick worms as he can see. Stay behind the cord and avoid feeling for toothpicks, as they have sharp points. In two or three minutes the class will receive a signal to stop.
4. All toothpicks collected are sorted into five coloured piles. The number of each colour is recorded.

yellow - 22	pink - 24
blue - 40	green - 48
red - 46	

5. Decide how to record your results to show protective colouring. Page 41 of *Studying Insects* shows how to record results on a bar graph.

6. Discuss your findings. In the example, which coloured toothpick worms were the easiest for the toothpick birds to find? Why? If you were a toothpick worm which colour would you rather be? Explain why. Suggest why yellow and pale pink offered the most camouflage. How would the time of year affect your results? Hint: Think of the fresh green grass of spring and the dead brown grass of fall.

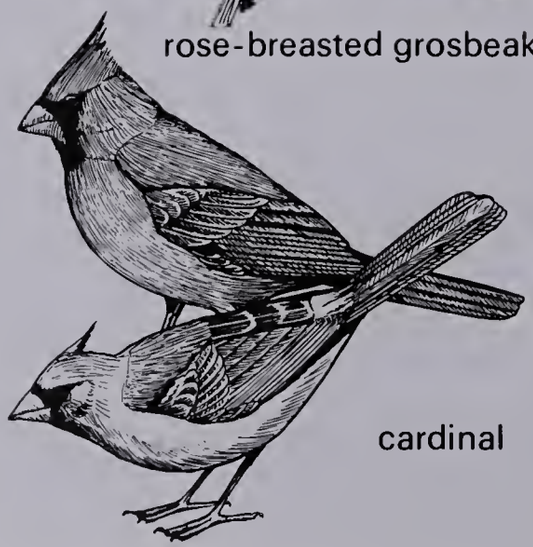
7. Protective colouring has a survival value to birds. Name some birds that match their surroundings. Explain how this pattern helps to protect the species.

8. Birds that nest on the ground in open spaces blend well with the surroundings. Usually both adults incubate the eggs in these cases, and are similar in appearance. The killdeer is an example.

When sexes differ greatly in appearance, (e.g. the rose-breasted grosbeak) the nest is often well hidden, although both may incubate the eggs.

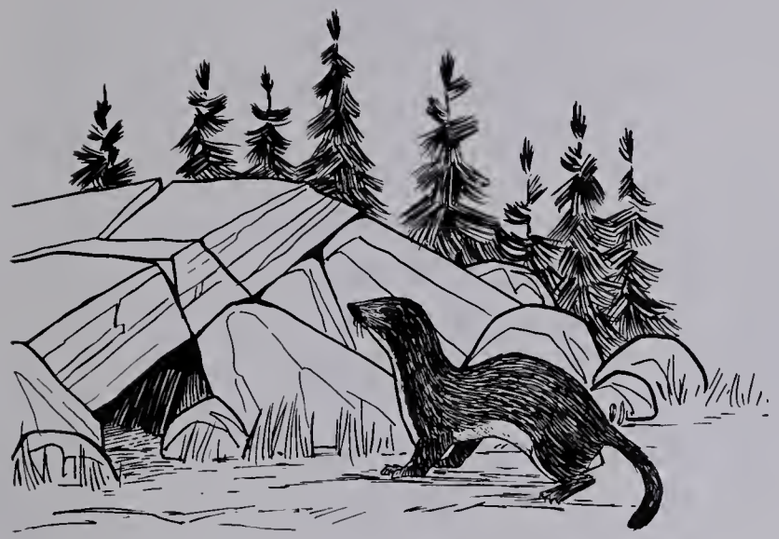
killdeer

rose-breasted grosbeak



cardinal

Find out which sex incubates the eggs when the male is brightly coloured. (Check the cardinal.)
See page 79 for further nest information and activities.



9. Ermine or weasels turn white to match the snowy winter habitat in which they live. Of all the whitish coloured birds found in Arctic regions, only one has a similar seasonal colour change. Which of these birds turns white during winter months?

snowy owl

ptarmigan

snow bunting

FLIGHT

A bird is well made for flight. Similar to a plane, it has a strong light and streamlined framework. What are the characteristics that help birds in flight? Compare your list with the following examples which Miss Moon's class developed together.

SKELETON

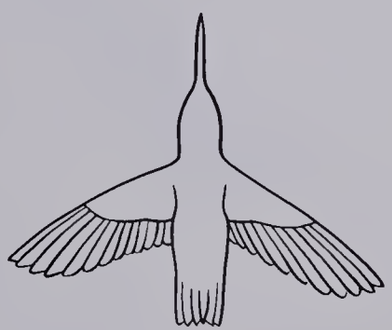
Many bones are *pneumatic* (filled with air, not marrow). Engineers know that hollow girders are stronger than solid ones of the same mass. This hollow beam idea is applied to the bones of birds. Mass is kept to a minimum because many bones are paper-thin. Other bones are attached or fused together to allow the firm *anchorage* of powerful flight muscles. Since birds do not have teeth, they have no need for heavy jaw bones.

FEATHERS

Like the hollow bones, feathers are very light in mass and are strong. They make a bird's body smooth and graceful, thereby giving little resistance to the air. Tail and wing feathers help to steer a bird and act as brakes. Feathers help to keep body temperature high by conserving heat. The annual moult occurs in late summer, well before migration.

SHAPE

The streamlined body with its pointed head, beak and tail, cuts through the air easily. Such broad, thin bones as the breast-bone allow large surface areas for muscle attachment. Wings, with their narrow upper surface and broad undersurface, act like wings on an aircraft. The tail is a rudder: it helps to balance and steer the bird.

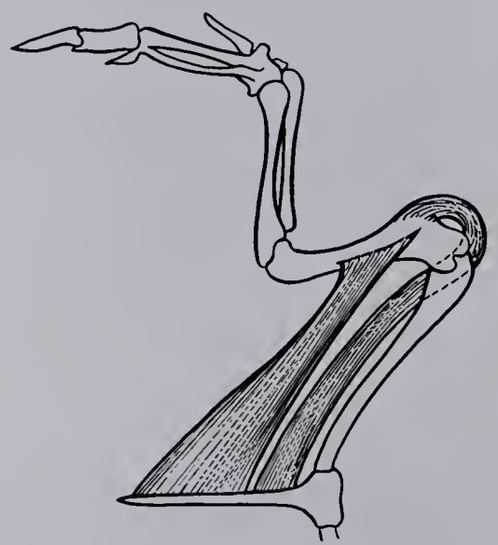


EYESIGHT

Birds have excellent sight, with a built-in telescope and magnifying glass all in one. They see long distances. A vulture watches for food from a mile high. Many birds have the ability to see at night.

MUSCLES

The wing muscles attached to the broad breastbone are very strong. Small skin muscles help to fluff the feathers.



BREATHING

Birds have small lungs and a system of large air sacs which reach all parts of the body. Unlike humans, birds make little effort when taking air into the body. Wing movement helps a flying bird to breathe.

Questions to Consider

1. Where have hollow girders been used in your school building?
2. Why are hollow girders stronger than solid ones of the same mass?
3. Where are the flight muscles on a bird? Which muscles on your body compare with these?
4. Birds have no teeth. How do they chew their food?
5. Discuss wind resistance. Experiment by moving your arms and hands to show wind resistance.
6. How can the tail feathers act like a brake?
7. What is the annual moult of birds?
8. Compare the bird and airplane under the following headings.
   (a) General shape.
   (b) Turning methods.
   (c) Shape of wings.
9. What can a bird's eye do that ours cannot?
10. How do the air sacs help the bird when flying?

Flight Patterns

Most birds use a combination of at least two of these types of flight patterns.
The drawings on these two pages are not to scale.

1. *Flapping.* Many birds use flapping flight in which both wings beat up and down together, e.g. robin, bluejay, heron.

2. *Soaring.* Some birds travel great distances without any visible wing action. They ride on updrafts of air, e.g. vultures, hawks and gulls.

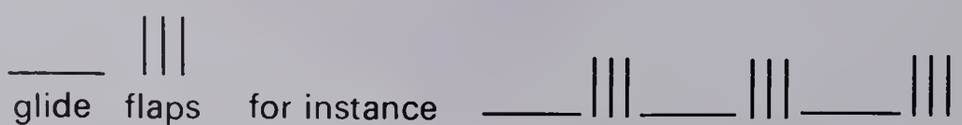
3. *Gliding*. When ducks or geese decide to land, they often descend in a long gliding motion.

4. *Hovering*. This type of flight needs help from a fresh headwind. The bird appears to stand still in the air, tail fanned out with wings moving, e.g. rough-legged hawk, tern or kingfisher.

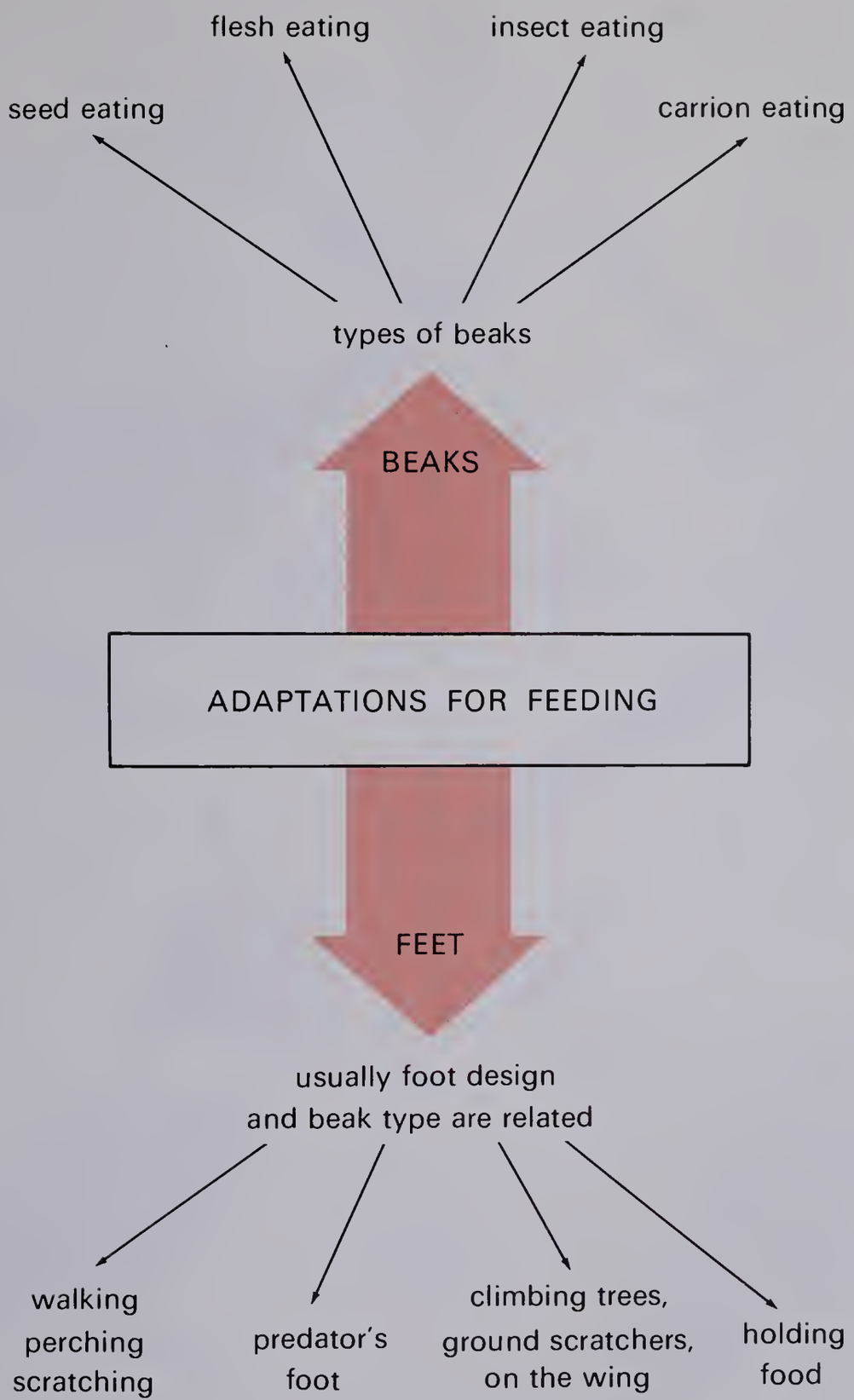
5. *Fluttering.* This is similar to hovering. A bird remains fixed in one place without the help of a headwind. The best example is the wee hummingbird which is like a miniature helicopter.

Things to Do

1. Collect chicken or turkey bones. Sort them into hollow bones and bones that are fused together. Compare these groups for mass and strength. Draw a cross-section of a hollow bone.
2. Which of the four main types of feathers floats through the air best? Compare the various types by timing your results. Test flight feathers for strength.
3. Make model birds from paper tail and wing pieces glued to paper straw bodies. Make paper kites. Why are some flights better than others? Design your own aircraft models from either paper or thin balsa wood. Experiment to see what effect wing position on the fuselage, mass, shape of nose, and wing shape have on your flight results.
4. Consider these points about flight. Books in the resource centre will be useful.
   (a) List birds that cannot fly.
   (b) Which birds fly in families?
   (c) Do birds fly with the wind or against the wind? Why?
   (d) Which bird can fly the farthest without resting?
   (e) How high can birds fly?
   (f) What happens to a bird's wings when it flies around a corner?
   (g) Which bird flies the fastest? Which is the slowest bird?
   (h) Where do the birds in your answer to (g) live?
   (i) Which bird weighs less than a penny and can fly backwards?
   (j) Which is the heaviest bird?
   (k) Do light birds move faster than heavy ones? Why?
   (l) Is this true of airplanes?



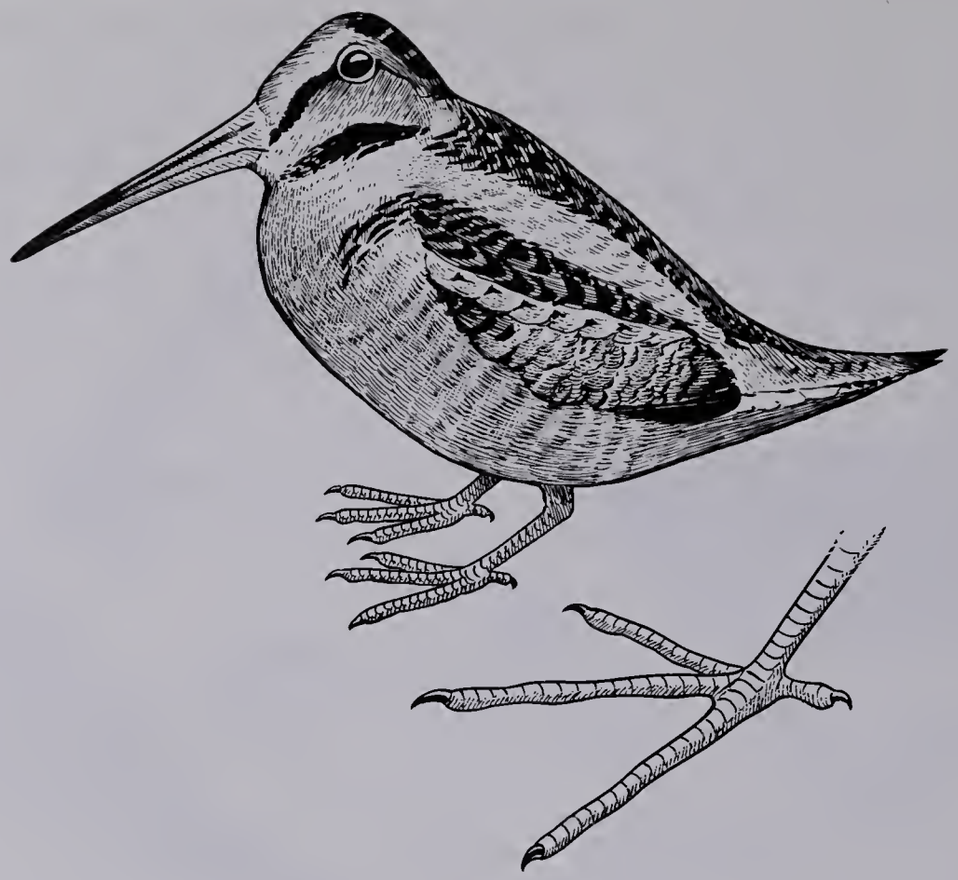
   (m) Observe any common bird. Record its flight pattern, using this key.

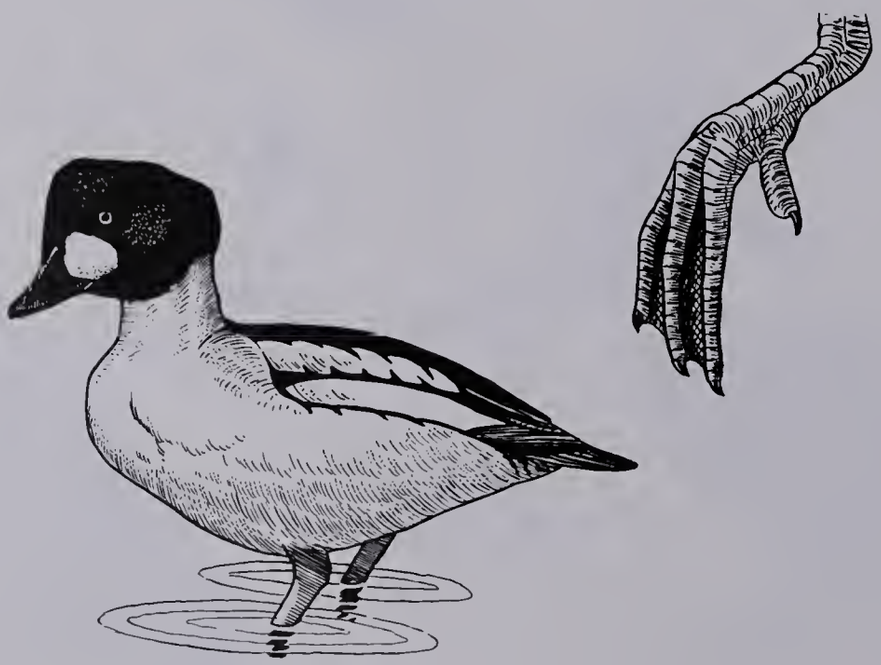

flesh eating
insect eating
seed eating
carrion eating
types of beaks
BEAKS
ADAPTATIONS FOR FEEDING
FEET
usually foot design
and beak type are related
walking
perching
scratching
predator's
foot
climbing trees,
ground scratchers,
on the wing
holding
food

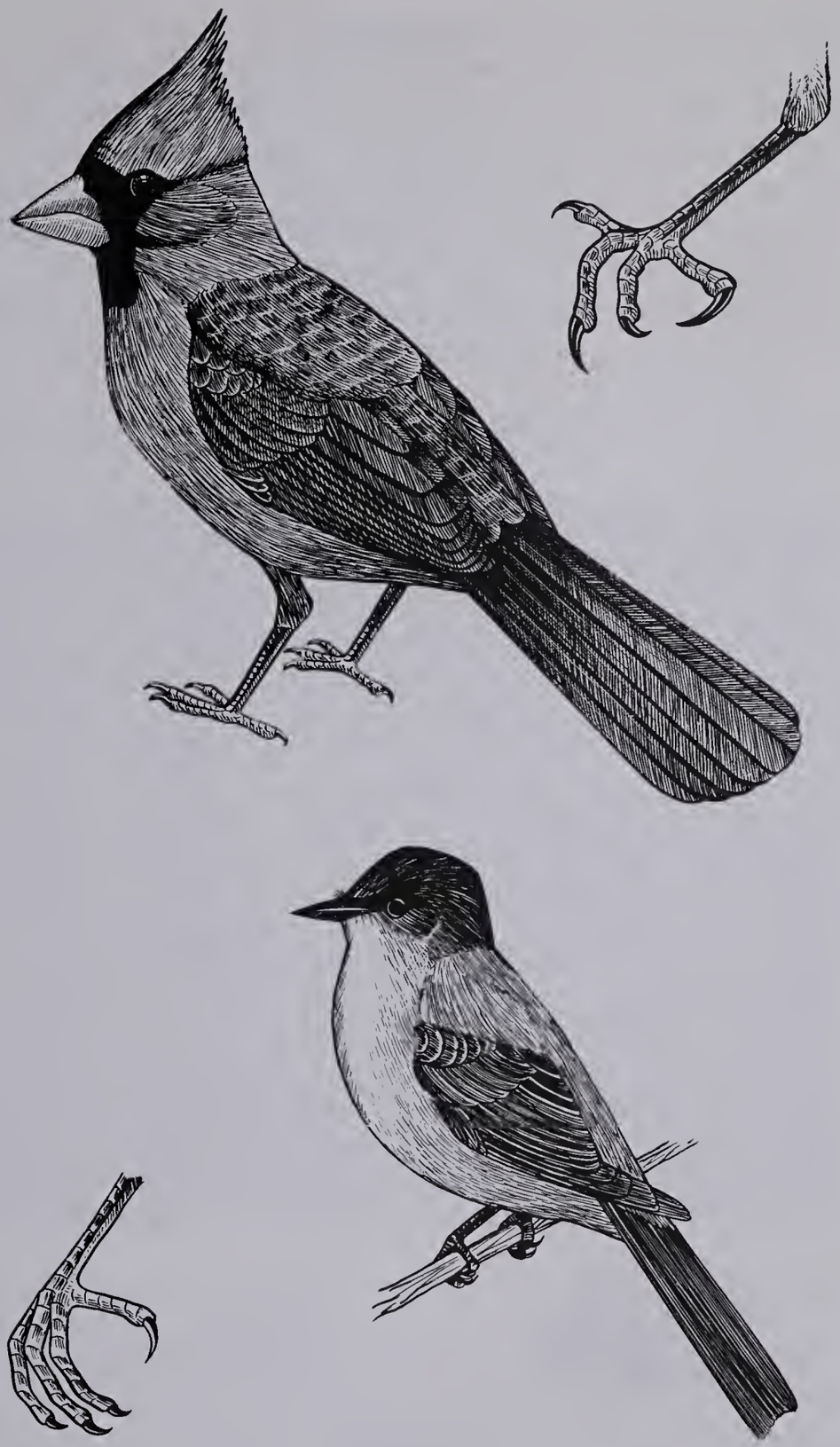
1. Match each of the birds with a box.

ADAPTATIONS FOR FEEDING
bird with spear-like bill and extra long toes with small webs for marsh wading
bird that seizes prey with strong, curved claws and tears it to pieces with sharp hooked beak
birds with bill able to dig out solid wood in search of insects while clinging vertically to tree trunks
bird relying on the accident of death, as feet are useless except for holding food which is then ripped by strong, pointed beak
bird with heavy seed-cracking bill. Likes to scratch for food on the ground or perch in trees and bushes
bird with feet too weak to walk, but a long needlelike bill to probe into flowers for nectar

2. Birds are well equipped to find food because their bills are *adaptations* of mouth parts. Feet are equally well designed. The following pictures show birds with foot and beak adaptations for feeding. Select any six and make your own clue chart.







Here are some problems to investigate.

1. How many toes do most birds have? Which bird has only two toes? How many toes do woodpeckers have projecting backwards? Explain why.
2. Have you ever tried eating a meal or building a house with your hands tied behind your back? Describe the many ways birds' bills and feet are used similarly to hands.
3. The grouse has a special foot adaptation in winter. Compare it with the snowshoes you might wear on a winter hike.
4. Which bird is expert in building a swinging cradle type of nest?
5. Seed-eating birds start their young on insects and gradually switch them to a vegetable diet. Pigeons are an exception. What do they feed their young?
6. What is an egg tooth? Do birds have other teeth? How and where do they grind up their food? Use stuffed birds when working on these questions.

Pellets

Birds regurgitate (spit up) hard balls of coarse or bulky material that cannot be digested through the small intestine (stomach tubes). These clean odourless balls are called pellets. Gulls will regurgitate pellets of fish bones and scales, while hawks and owls spit up balls of fur, bones, teeth and feathers. What type of pellet would an insect-eating bird regurgitate?

It is always exciting to solve a mystery. Are you a good wildlife detective? Owls are especially good subjects because they swallow much of their prey whole.

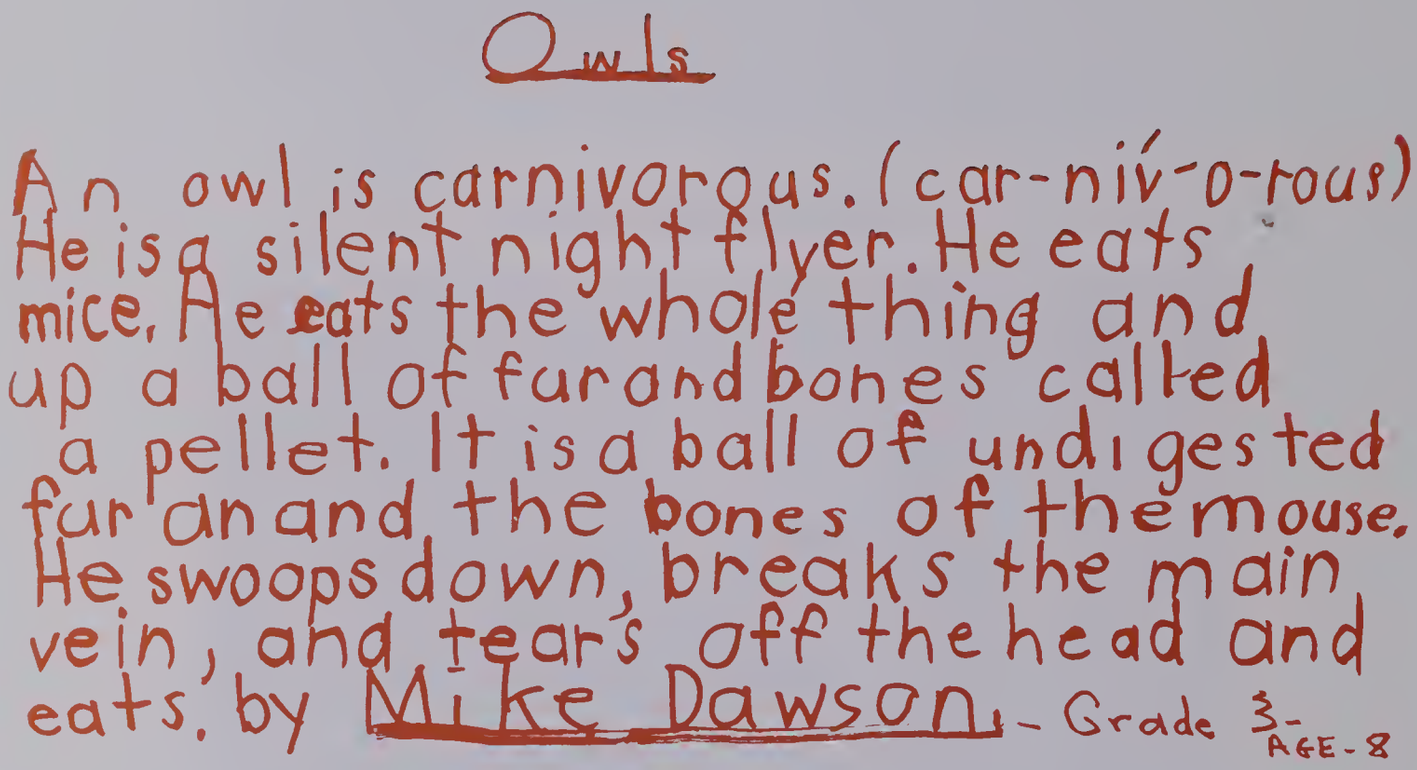
owl pellet

1. Search for owl pellets around owl roosts or nesting areas.
2. Inspect these balls of brown and grey fur more closely. What do you notice amongst the fur?
3. Scientists dissect owl pellets to find out not only *what* but *how much* was eaten. Use a pair of tweezers and a toothpick to carefully dissect pellets. Classify the contents into piles of fur, skull bones, jaws, wing and leg bones.
4. Use mammal and bird books to decide whether the bones come from birds, mice, shrews or moles.

An Unusual Pet

One October day several years ago, a saw-whet owl was attacked by a hawk during fall migration. A junior class in southern Ontario rescued this small owl and named it Wee Willy. For two years crippled Wee Willy survived on donations of mice, shrews, moles and small birds. The pupils had an excellent

opportunity to study Wee Willy's pellets first hand. They knew exactly what their owl's diet had been. The story below shows what Mike learned from his observations.



Owls

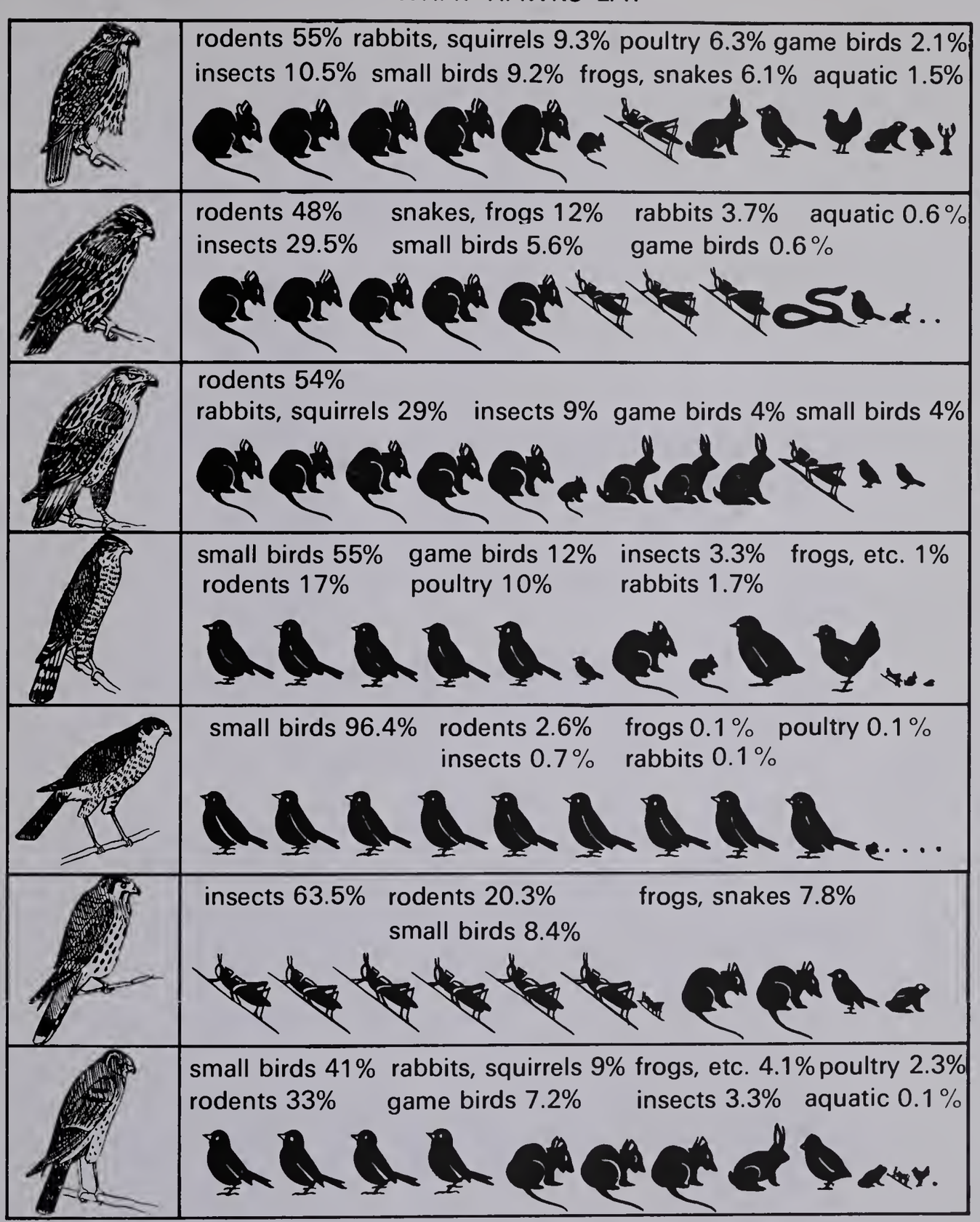
An owl is carnivorous. (car-niv-o-rous) He is a silent night flyer. He eats mice. He eats the whole thing and up a ball of fur and bones called a pellet. It is a ball of undigested fur and the bones of the mouse. He swoops down, breaks the main vein, and tears off the head and eats. by Mike Dawson. - Grade 3- AGE-8

Hawks — "Living Mousetraps"

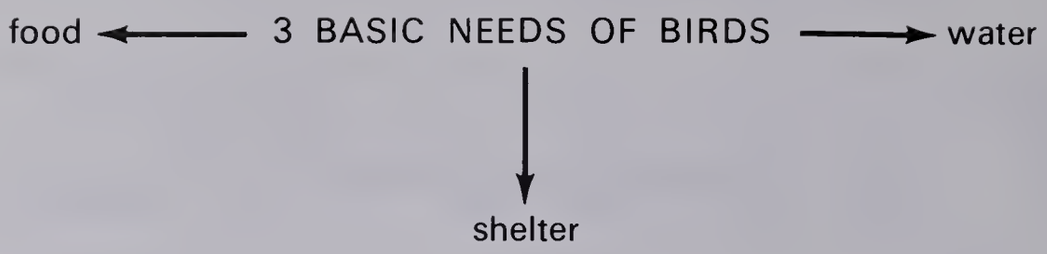
It has been said that hawks are one of the farmer's best mousetraps. From the chart, say which two kinds of hawks eat rats and mice more than half their time. Which small falcon lives chiefly on insects? One accipiter-type hawk kills small birds. Name this hawk. (This is not a "bad" bird, because it kills *surplus populations*. Nature can support only a certain number of particular creatures, which are adapted to withstand predation. Chapter 6 will help you to understand why.)

Explain why you think hawks and owls should be protected.

WHAT HAWKS EAT


western red-tail
rodents 55% rabbits, squirrels 9.3% poultry 6.3% game birds 2.1%
insects 10.5% small birds 9.2% frogs, snakes 6.1% aquatic 1.5%
Swainson's
rodents 48% snakes, frogs 12% rabbits 3.7% aquatic 0.6%
insects 29.5% small birds 5.6% game birds 0.6%
ferruginous rough-leg
rodents 54%
rabbits, squirrels 29% insects 9% game birds 4% small birds 4%
BUTEOS
Cooper's
small birds 55% game birds 12% insects 3.3% frogs, etc. 1%
rodents 17% poultry 10% rabbits 1.7%
sharp-shinned
small birds 96.4% rodents 2.6% frogs 0.1% poultry 0.1%
insects 0.7% rabbits 0.1%
ACCIPITERS
sparrow
insects 63.5% rodents 20.3% frogs, snakes 7.8%
small birds 8.4%
FALCON
marsh
small birds 41% rabbits, squirrels 9% frogs, etc. 4.1% poultry 2.3%
rodents 33% game birds 7.2% insects 3.3% aquatic 0.1%
HARRIER

Feeders



You can help birds with food by keeping feeders and planting shrubs and trees that attract birds.

Suet. Beef suet is often available at the meat market, free of charge. Ask for "old fat". Birds will not eat yellow suet or mutton suet.

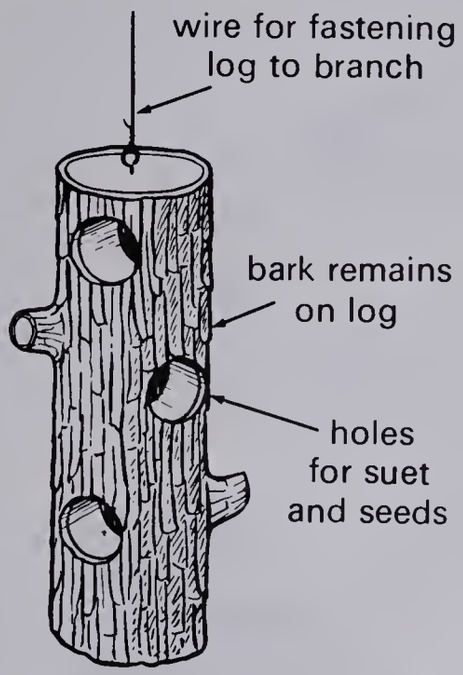
Seeds. Many commercial seed mixtures are on the market. Make a survey of quantities, content and costs before you buy seed. A well-balanced seed mixture might contain:

sunflower—30%	cracked corn—30%
millet —30%	buckwheat —10%

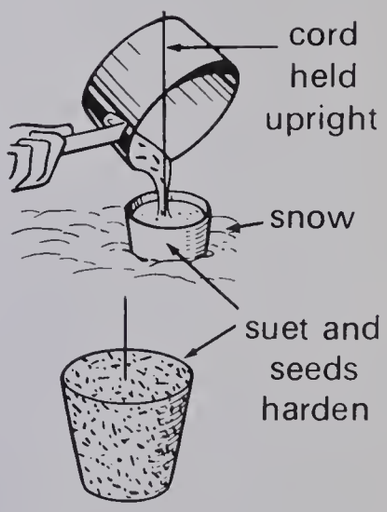
Scratch-feed, broken nuts, peanut butter and crumbs can be added if desired. Weedseed sweepings or husked sunflower sweepings at a feed mill can be obtained at a very low cost. Remove corn kernels from cobs and grind them through a meat grinder into a pile of finely chopped cracked corn.

Your feeder should have the "welcome" mat out for all comers. Remember, each species should be enjoyed for its own characteristics. Most naturalists gain as much pleasure from mammal visitors as bird visitors. It takes time to establish a new feeder, so be patient. When you watch at a feeder, you must be very still. Why?

1. *Suet Feeder for Insect-eating Birds.* Hang it on a tree or on a clothes line. Select a log about 10 cm across by 50 cm long. Drill holes at least 3 cm deep for the suet. Fill the feeder with suet.

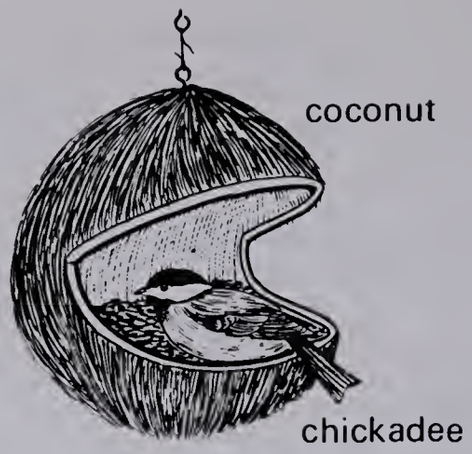


Suet Bag Feeder. Avoid wire or metal soap-shaker types of container. Why? Suet chunks are placed in a mesh bag such as an onion bag.

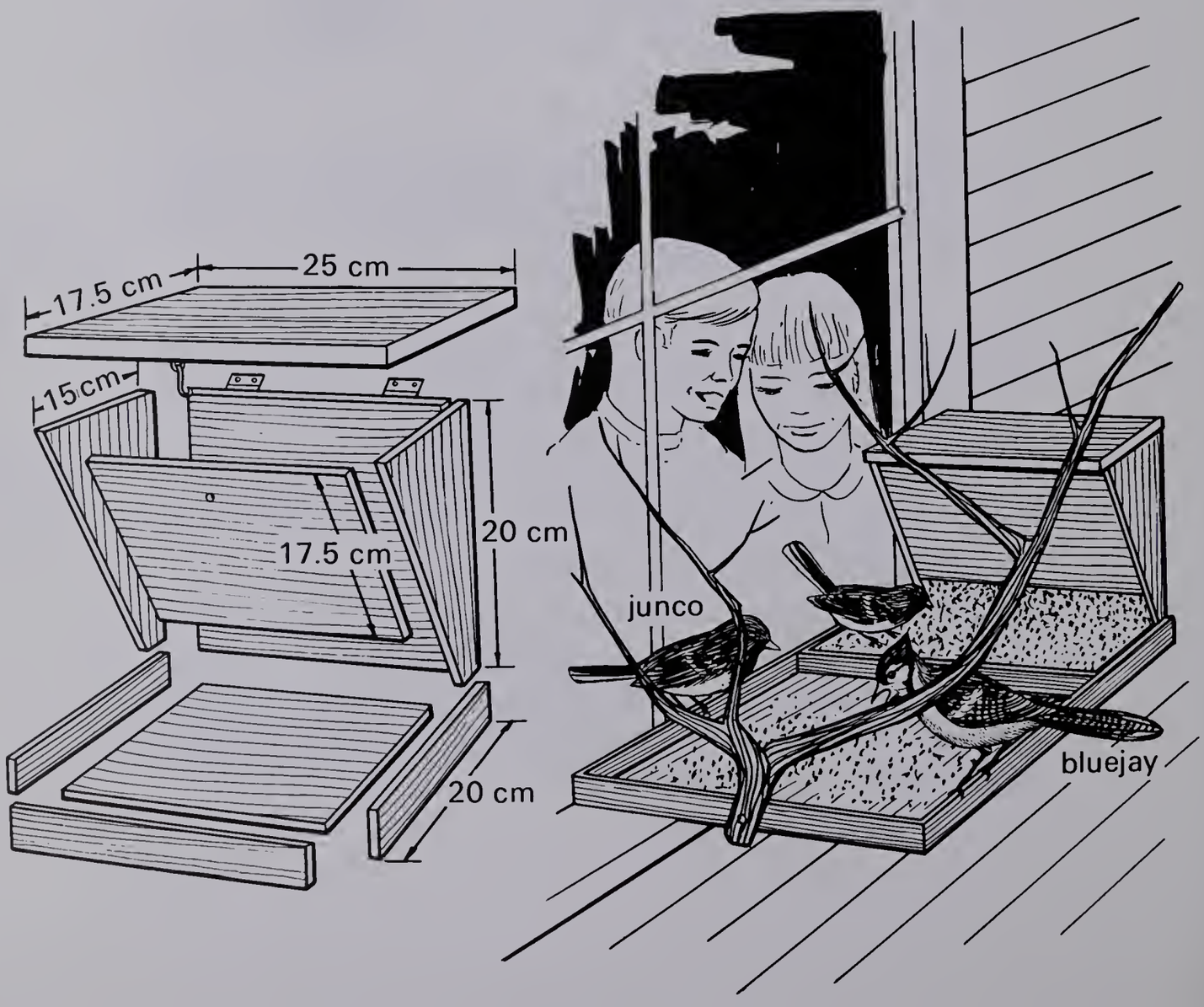


Suet Dixie-cup Feeder. Melt the suet over a camp stove in the school yard. Knot a cord through the bottom of a dixie-cup. Place the dixie-cup in a depression in the snow. Pour the liquid suet and seeds into a cup. Hold the string upright until the suet hardens, tear away the paper cup and hang the feeder on a branch.

Birds need fatty materials to keep their very high body temperatures. Try making your own bird porridge recipes or suet-seed cakes. What formula or mixture of ingredients do you find most suitable?

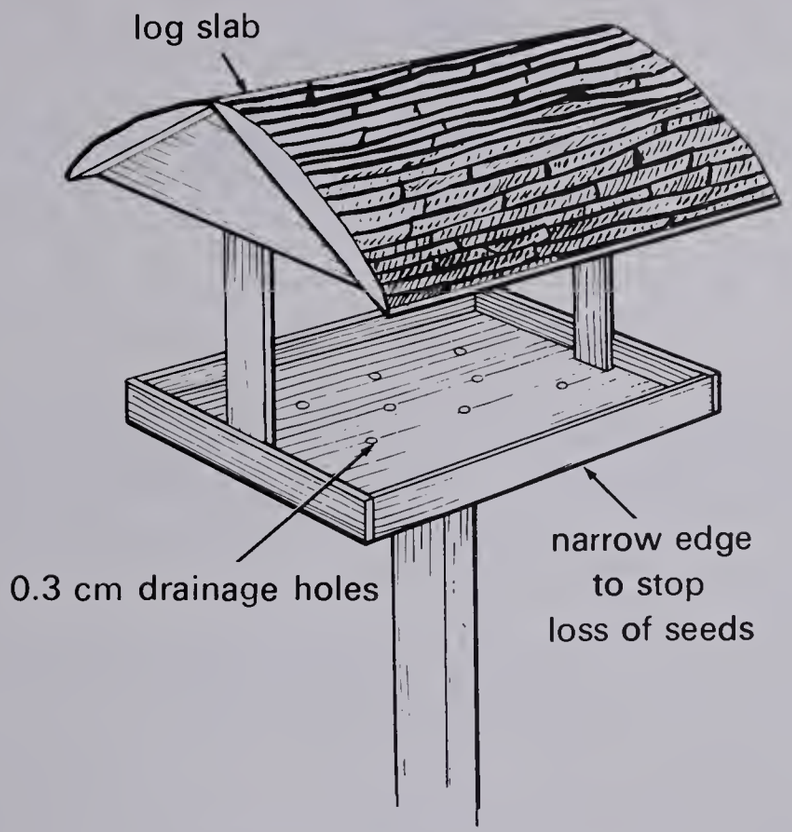


2. *Seed Feeders for Seed-eating Birds.* Coconuts cut as shown or cut completely in half make ideal individual feeders. After the coconut meat has been eaten, the shell can be filled with seeds.



Window Tray. A feeding tray at the window brings birds into close range for observation. The shelf should have a narrow edge to prevent loss of seed.

Covered Platform Feeder. Important: This feeder should be maintained from mid-autumn to early spring. Birds tend to become dependent on feeders during the winter, so once started they *must not* be neglected. Heavy snow and ice storms can be disastrous to birds if their food supply is withdrawn.



Place platform feeders in safe open area for birds.
Make feeder size of available wood. Edge prevents wind from wasting the seed.
Bark slabs for roof give protection from snow and ice.

3. *Hummingbird Vial for Nectar-feeding Birds.* Make a solution of 5 ml teaspoon of honey to 15 ml teaspoons of water. Add several drops of red food colouring and mix. Place the mixture in a small test-tube or small pill vial and fasten it by wire to a flower stalk, garden stake or shrub in the garden.

Problems to Investigate

1. Consider the special foot and bill adaptations of feeder birds. What is the connection between these and the type of food selected?
2. From the foods at your feeder, which kinds do various species prefer?
3. What sexual differences can you observe in your feeder guests, e.g. woodpeckers and grosbeaks?
4. Describe the various bird behaviour patterns displayed at your feeder.
5. What movements by observers cause alarm amongst feeding birds?
6. What do the small birds do when a shrike or hawk appears?
7. List the species that feed in flocks at the feeder.
8. Devise a record to show the time of day when each species is most active at the feeder.
9. Each student should select a certain species and record its trips to the feeder in a 20 min period.

10. Keep a long-term record of birds' visits to your feeder.

BIRDS AT OUR FEEDER				
	Kind	1970	1971	1972
1	bluejay	Jan. 1		
2	downy woodpecker	Jan. 3		
3				

11. Experiment with various colours in the nectar type feeder. Record your results.

SENSES

Man is considered to have five well-developed senses. What are they? Birds have the same senses to a greater or lesser degree. Birds also have two other, more strongly-developed, senses. These are direction and balance.

SENSES OF BIRDS

well developed
1. visual
2. auditory
3. balance
4. direction
5. Tactile (touch)

poorly developed
1. smell
2. Taste

Visual

Search for evidence that such birds of prey as hawks and ospreys have keen vision. An old tale states that owls are nearly blind in daylight. Find information against this story.

Compare monocular and binocular vision. When a robin hunting worms on the front lawn cocks its head to one side, it is not listening for the worm. Which type of vision is it using? Which species is believed to have only binocular vision?

Give two examples of how birds' ability to tell different colours is of value to them.

Birds have a third eyelid which is called a *nictitating membrane*. How does it work? What help is it to the bird? During an eclipse of the sun you are warned not to stare at the sun. Birds can do so without harm. Why?

Hearing

Examine a mounted owl to locate the huge ears. Why are they not outwardly visible? Do the ear tufts on a great horned owl affect its hearing ability? Why?

Calling birds. Many good birdwatchers coax birds to an area by making a series of noises. Select a place where you know birds are likely to be. A small thicket, or beside a brushy path are good areas. Use the back of your hand and make several "kissing" noises with your mouth. How long does it take the birds to respond? How many can you hear or see? Another method is to make a "pishing" noise, pish . . . pish . . . pish. Compare the two techniques.

Balance

We have already discussed how birds move freely in the air, on land, or in water. Why is a good sense of balance so necessary for this way of life?

Direction

This sense is strongly developed in birds, as we shall see in detail in Chapter 3.

Touch

Some scientists feel that this sense is poorly developed, because it may be somewhat "deadened" by feathers. Others argue that birds that use their bills or tongues when they are hunting for food, have a keen sense of touch. Gather information on these two views and discuss them.

woodpecker

shorebird

duck

What is the brood patch of a bird? Is it true that the sense of touch automatically controls egg production?

The American woodcock has an unusual bill adaptation related to the sense of touch. What can you find out about this?

Smell and Taste

In 1835 John James Audubon used the vulture to conduct one of the first scientific experiments into the sense of smell in animals. Did he find that the vulture is attracted to a road kill by its sense of smell or by sight?

Perhaps your school has team teaching. Your own nose and tongue work as a team daily. Try this experiment. Cut an apple, celery stalk, onion, potato and turnip into equal sized cubes. Blindfold your friend and ask him to pinch his nose. One by one, place each cube on his tongue. Can he identify the various cubes? Repeat the procedure without pinching the nostrils. What difference does this make to the results?

Chapter 3

MIGRATION

The regular mass movement of birds between two areas, usually a yearly round trip in spring and fall, is known as migration. Man has been aware of migration since ancient times. Check these Biblical references in the Old Testament which relate to migration.

Exodus (Chapter 16, verse 13) Job (Chapter 39, verse 26)
Numbers (Chapter 11, verse 31) Jeremiah (Chapter 8, verse 7)

EARLY THEORIES (IDEAS)

Early man did not doubt that large birds could make great flights, but he was puzzled at the disappearance and reappearance of small birds. As a result, several main theories were advanced.

1. *Transportation.* According to this theory, small birds hitchhiked a ride "piggy-back" style on the backs of larger birds. Even today, one reads newspaper stories of Canada geese carrying hummingbirds on their backs. These reports when investigated prove to be false.

2. *Transmutation.* Aristotle, a most important naturalist of olden times, insisted that one species turned into a different species for part of the year. He claimed that the European robin changed into a European redstart for the summer.

3. *Trip to the Moon.* An unknown Englishman in London, England in 1703 introduced a theory that birds migrated to the moon on a trip that took only 60 d.

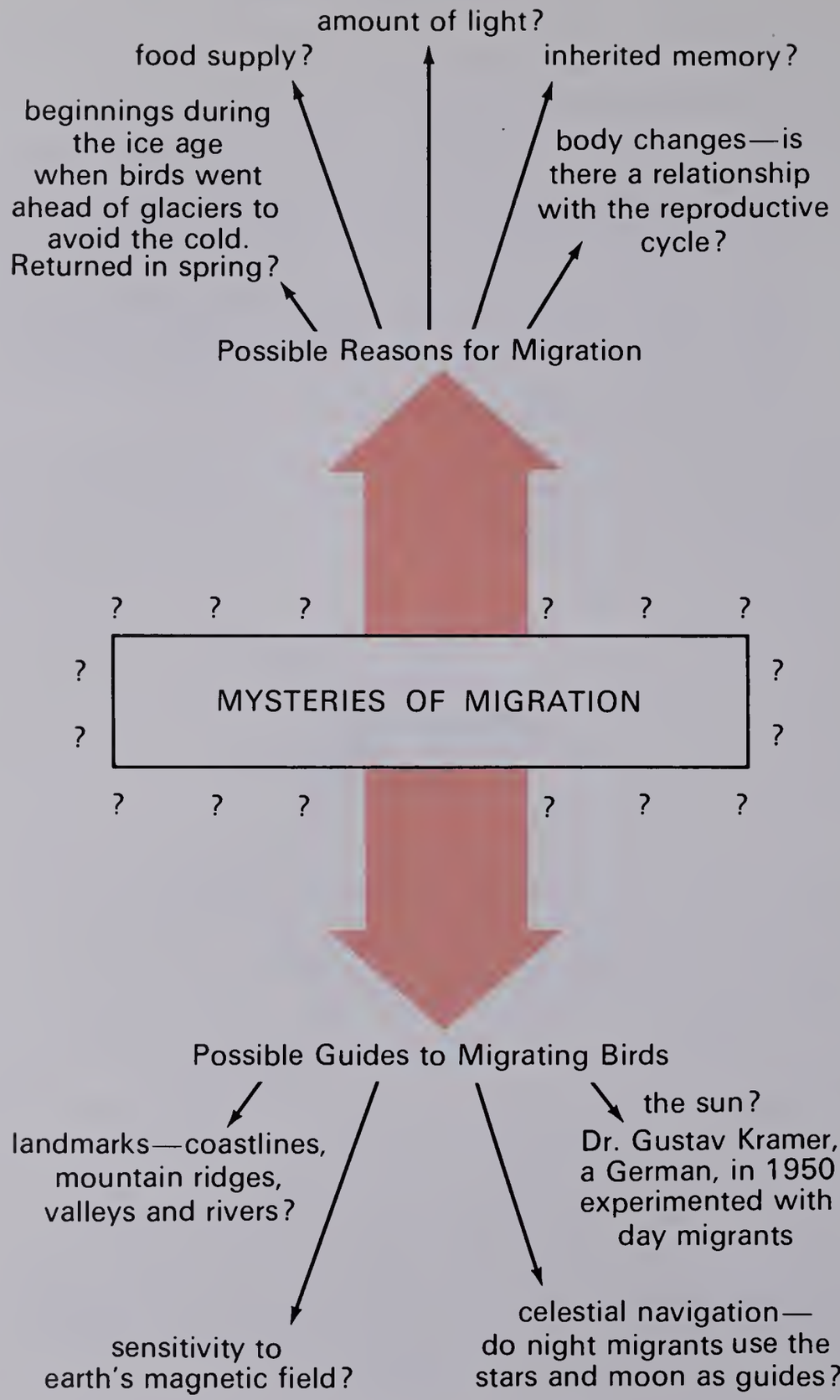
4. *Hibernation*. Similar to some amphibians, reptiles, fish and insects, swallows were thought to bury themselves in the mud and hibernate for the winter. Studies in 1946 by Dr. E. C. Jaeger in southeastern California showed that a poorwill (a small night bird of the whip-poor-will type) can remain inactive in a deep sleep-like condition for 88 d. Whether this can be called true hibernation or not needs more study. Early theories have been replaced by new ideas resulting from scientific studies and data collected from bird banding. Still, the age-old riddle of migration is far from solved.

Wild Goose

"Wild goose! Wild goose!
  How do you know the way,
From Southern California
  To the top of Hudson Bay?"
"Honk! Honk!" said the wild goose.
  "How should a body know?
I learned it in my geography,
  A hundred years ago."

Isabel Bayne

In the northern hemisphere, migration is most pronounced. More than one-third of the world's species of birds migrate. Each of the following factors is worth consideration: investigate them to find their strengths and weaknesses.


amount of light?
food supply?
inherited memory?
beginnings during the ice age when birds went ahead of glaciers to avoid the cold. Returned in spring?
body changes—is there a relationship with the reproductive cycle?
Possible Reasons for Migration
? ? ? ? ? ?
? ?
MYSTERIES OF MIGRATION
? ?
? ? ? ? ? ?
Possible Guides to Migrating Birds
landmarks—coastlines, mountain ridges, valleys and rivers?
the sun?
Dr. Gustav Kramer, a German, in 1950 experimented with day migrants
sensitivity to earth's magnetic field?
celestial navigation—do night migrants use the stars and moon as guides?

BANDING

Although scientists are still confused about the reason *why* birds migrate, they have learned a great deal about migration from birdbanding. Birds are caught in nets, an identification band is clamped on one leg and the bird is released. Since detailed records are made at birdbanding time, many questions are answered if the band is returned later.

Facts and Figures

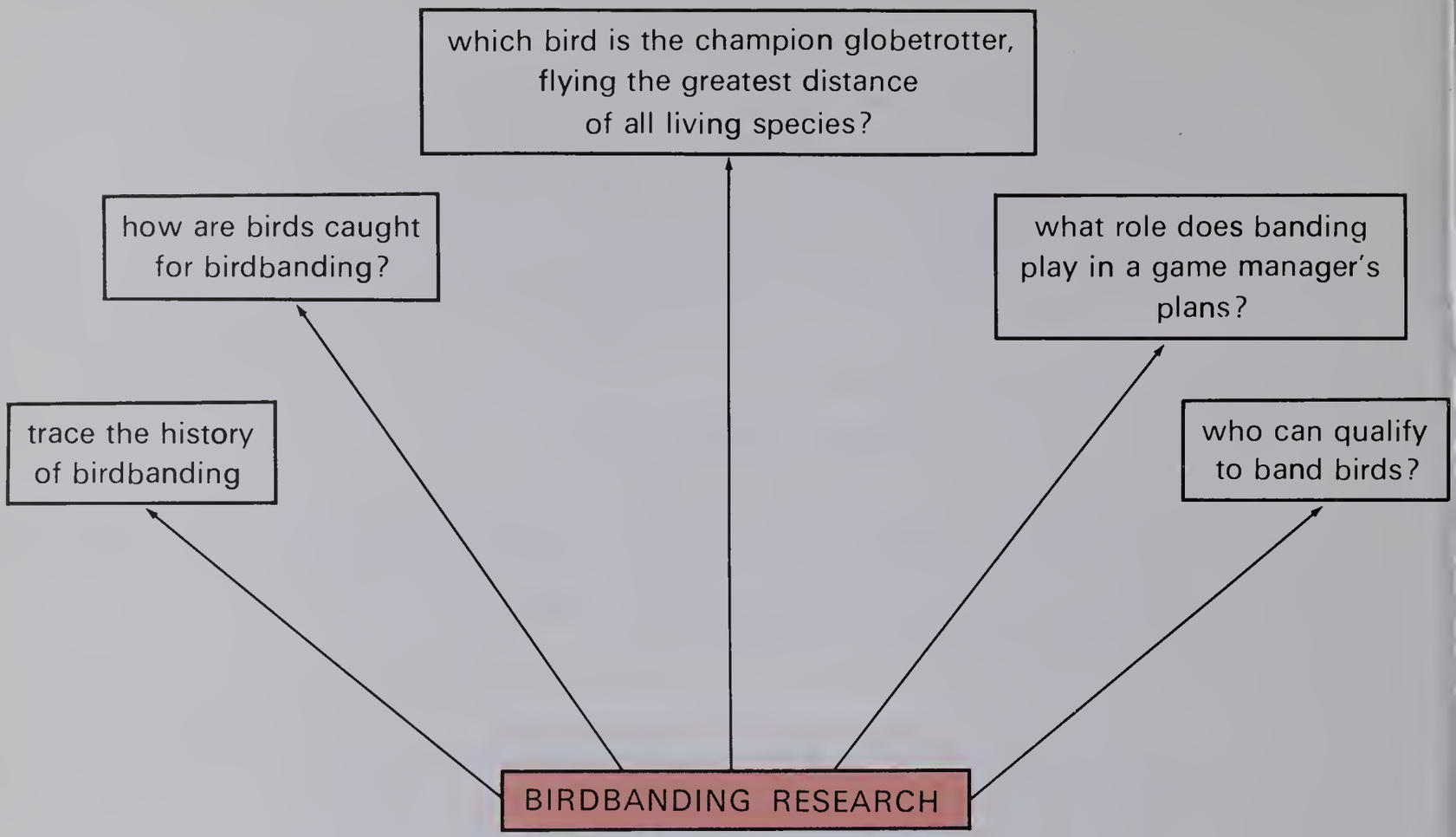
Fastest Official Record: A lesser yellowlegs (shorebird) banded along the coast of Massachusetts, U.S.A. was shot five days later on the island of Martinique, 3090 km away. What mileage did this bird average per day?

Age Record: A nestling Caspian tern banded in Michigan during 1925 was shot in Ohio in 1951. How old was this bird?

Birds banded on breeding grounds return to the same area year after year. An American redstart, banded at Wolfville, Nova Scotia, in 1929 was retrapped at the same banding station in 1930 and again in 1931.

In a study of Manx shearwaters on Skokholm Island, Wales, a bird was transported to Boston airport, U.S.A. and released; 12½ d later, the same bird was found in its burrow on Skokholm some 4880 km away.

Another scientist experimented with crows to see how long the urge to migrate lasts. He raised young crows in captivity in Alberta. Long after the regular crow migration time had passed and snow had come, he released his captives. They at once flew towards Oklahoma, U.S.A. where their adults were wintering. Banding records again supported this experiment.


which bird is the champion globetrotter, flying the greatest distance of all living species?
how are birds caught for birdbanding?
what role does banding play in a game manager's plans?
trace the history of birdbanding
who can qualify to band birds?
BIRDBANDING RESEARCH

What to Do When You Find a Band

Canada, Mexico and the United States work together in bird-banding. All information from North American bands is coded on computer cards which are filed in Washington, D.C.

If you find a band, straighten it out and tape it to a piece of heavy writing paper, with this information.

1. Your name and address (print plainly).
2. All letters and numbers on the band.
3. The date you found the band.
4. Where you found the band (nearest post office, town or city, county, province, country).

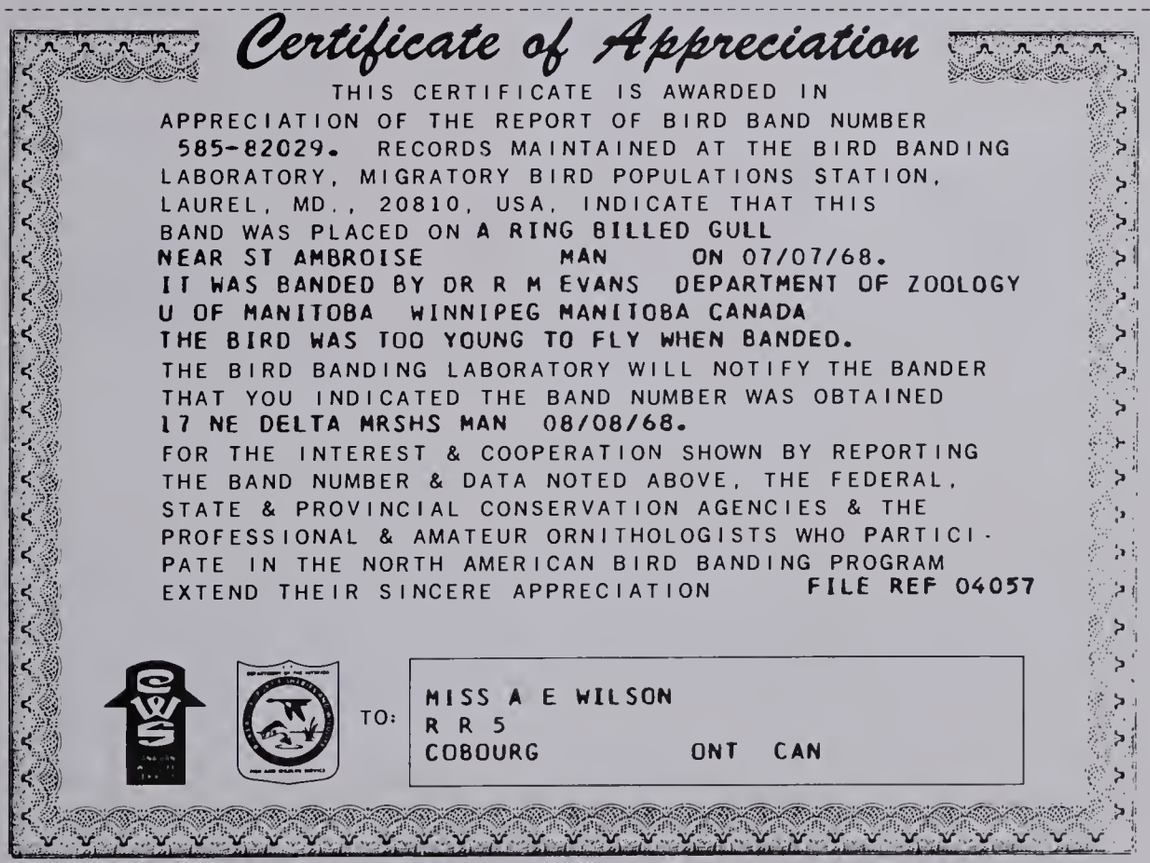
5. Give details of the bird (dead, shot, trapped or some other reason).

Place the band in an envelope and mail it to:

Bird Banding Laboratory,
U.S. Dept. of the Interior,
Fish and Wildlife Service,
Laurel, Maryland 20810,
U.S.A.

Important: Do *not* remove a band from a living bird. Simply *record* all information you know about the bird, release it carefully and send the data to the Bird Banding Laboratory. They, in turn, will notify you when and where the bird was banded, what kind it was and who banded the bird. The bander will also learn that you found the bird. Banding returns are exciting and make geography interesting. Check birds washed up on shore and road kills for bands.

Permission to band birds in Canada must be obtained from the Canadian Wildlife Service, Department of Indian Affairs and Northern Development, Ottawa .



Certificate of Appreciation

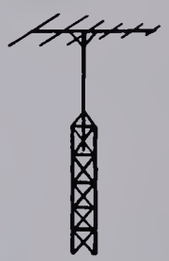
THIS CERTIFICATE IS AWARDED IN
APPRECIATION OF THE REPORT OF BIRD BAND NUMBER
585-82029. RECORDS MAINTAINED AT THE BIRD BANDING
LABORATORY, MIGRATORY BIRD POPULATIONS STATION,
LAUREL, MD., 20810, USA, INDICATE THAT THIS
BAND WAS PLACED ON A RING BILLED GULL
NEAR ST AMBROISE MAN ON 07/07/68.
IT WAS BANDED BY DR R M EVANS DEPARTMENT OF ZOOLOGY
U OF MANITOBA WINNIPEG MANITOBA CANADA
THE BIRD WAS TOO YOUNG TO FLY WHEN BANDED.
THE BIRD BANDING LABORATORY WILL NOTIFY THE BANDER
THAT YOU INDICATED THE BAND NUMBER WAS OBTAINED
17 NE DELTA MRSHS MAN 08/08/68.
FOR THE INTEREST & COOPERATION SHOWN BY REPORTING
THE BAND NUMBER & DATA NOTED ABOVE, THE FEDERAL,
STATE & PROVINCIAL CONSERVATION AGENCIES & THE
PROFESSIONAL & AMATEUR ORNITHOLOGISTS WHO PARTICI-
PATE IN THE NORTH AMERICAN BIRD BANDING PROGRAM
EXTEND THEIR SINCERE APPRECIATION FILE REF 04057

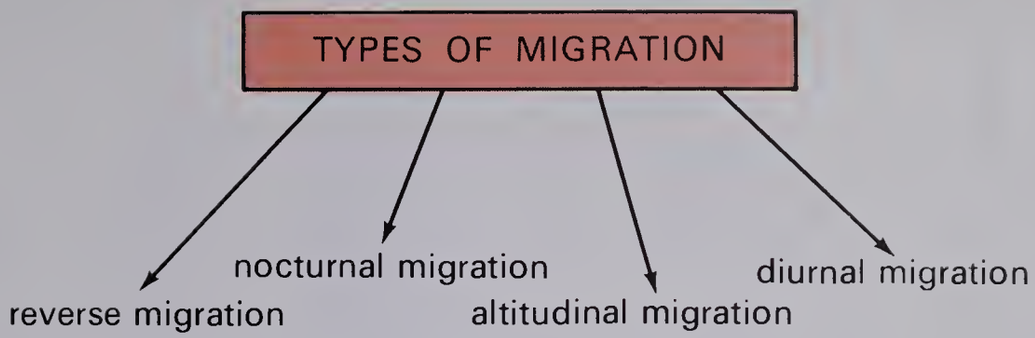
TO:
MISS A E WILSON
R R 5
COBOURG ONT CAN

RISKS IN MIGRATION

The greatest risks in a bird's life are during migration trips. Birds fly great distances without the use of map or compass. Young birds make the journey into unknown areas, since adult birds have already migrated. In your record book list dangers migrating birds face.

RISKS TO BIRDS IN MIGRATION	
Natural dangers	Man-made dangers
1 2 3 4	1 2 3 4





Match the above terms to the correct meaning.

1. _____ Chiefly day–migrants such as swallows, broad-winged hawks, skeins of ducks and geese.
2. _____ Birds that breed on high mountains often fly to lower slopes and valleys as winter approaches.
3. _____ Night–migrants are often weak flyers, shy or secretive birds such as bitterns, thrushes and warblers.
4. _____ Large numbers of birds go in the opposite direction to the one they should be going. At Point Pelee, Ontario, on the north shore of Lake Erie, migrants will often move southward in spring, in great numbers.

MAJOR FLYWAYS

During migration, birds fly over every part of North and South America but there are certain pathways where most flights take place. Remember that many waterfowl switch from one flyway to another in their travels.

MAJOR FLYWAYS

The four flyways are: Mississippi, Atlantic, Central, Pacific. Identify them. The maps are used by permission of the United States Department of the Interior, Bureau of Sport, Fisheries and Wildlife.

Things to Do

1. *Local Migratory Patterns.* We have learned how birds are adapted to fit their surroundings; perhaps the most obvious adaptation is the yearly migration of many species to other areas. Bird survey charts help to find local bird migration patterns. Make your observations in a scientific way, recording data accurately. When several months have been completed, analyse the results.

BIRD SURVEY

Month: Jan. 1-31, 19--

Location:

NO.	BIRD SEEN	MAX. SEEN	NO. SIGHT.
1	downy woodpecker	4	38
2	blue jay	8	96
3	snow bunting	100	5
4	hairy woodpecker	1	30
5	herring gull	8	35
6	tree sparrow	24	46
7	cardinal	2	31
8	red-tailed hawk	2	6
9	horned owl	1	4
10	black-capped chickadee	6	94

Month: Feb. 1-28, 19--

Location:

NO.	BIRD SEEN	MAX. SEEN	NO. SIGHT.
1	downy woodpecker	4	48
2	blue jay	4	48
3	snow bunting	50	12
4	hairy woodpecker	1	15
5	herring gull	10	48
6	tree sparrow	26	80
7	cardinal	2	16
8	red-tailed hawk	1	16
9	horned owl	1	10
10	black-capped chickadee	10	75
11	starling	12	40
12	horned lark	6	8

Month: Mar. 1-31, 19--
Location:

NO.	BIRD SEEN	MAX. SEEN	NO. SIGHT.
1	downy woodpecker	4	50
2	blue jay	6	36
3	snow bunting	30	3
4	hairy woodpecker	1	10
5	herring gull	12	60
6	tree sparrow	12	30
7	cardinal	1	12
8	red-tailed hawk	1	30
9	horned owl	2	16
10	black-capped chickadee	8	60
11	starling	15	35
12	horned lark	10	22
13	killdeer	2	10
14	robin	3	11

Max. seen: the maximum number of this bird seen together at any one time.

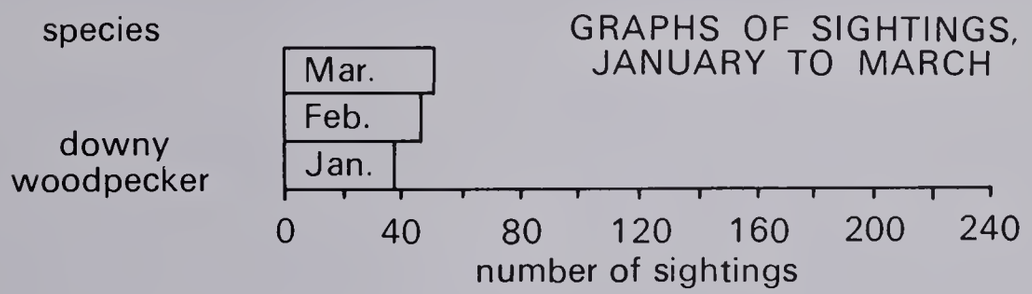
No. sightings: the number of separate times the bird was seen in the month. You may wish to record this data on index cards or a small pad, then transfer totals to monthly record.

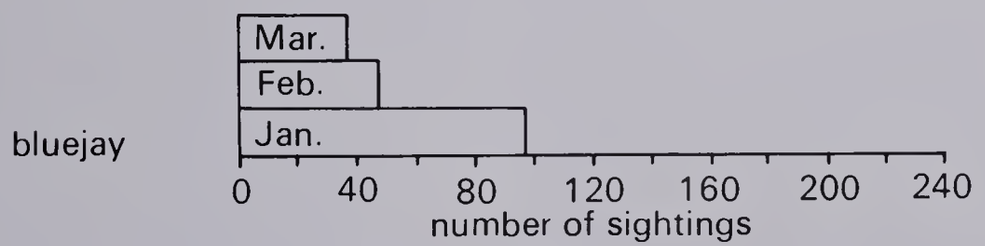
Analyse your bird survey. Estimate the number of each species in your area for each month. To do this, set up a chart like the one on the next page.

To get the numbers in the chart, multiply the *number of sightings* by the *average* number seen at any one time. The average is approximately one half of the maximum number seen at any one time. For instance, downy woodpeckers in January: $38 \times 2 = 76$.

ESTIMATED NUMBER OF BIRDS IN AREA			
Species	Jan.	Feb.	Mar.
downy woodpecker	76	96	100
blue jay	384	96	108
snow bunting	250	300	45

2. Make bar graphs of the number of sightings for 10 birds to show how the number of sightings varies from January to March. Species showing little variation are those which do not migrate but rather follow food sources in an area.





3. Use your bird survey charts and your own observations to answer these questions.

(a) Which birds migrate into and out of your area?

(b) What bearing do bird feeders have on your results during January and February?

(c) Consider the movements of winter finches such as snow buntings, grosbeaks and crossbills, in your area. Where do they obtain food?

4. Group the birds from your survey into three classes.
   (a) Those alone or in small numbers (1 to 5 birds).
   (b) Those seen in small flocks (about 6 to 12);
   (c) Those seen in large flocks.
   Using the heading "Flocking Habits of Birds Observed", make a chart for each of these groups.

5. Habits of individual birds are also interesting. Select a good place for observation, such as a feeder. Record the number of visits to the feeder made by three different species in a 15 min. period. Compare the number of visits by the different species. Keep records at various times during the day. Is there a time of greatest activity? Do species appear to differ in their time of activity? How does bad weather influence the number of trips?

6.

Yellow-bellied Sapsucker, SR, VR
Hairy Woodpecker, PR, U
Downy Woodpecker, PR, U
Black-backed Three-toed Woodpecker, PR U
Northern Three-toed Woodpecker, PR, VC
Eastern Kingbird, SR, FC
Say's Phoebe, SV, VR
Traill's Flycatcher, SR, C
Least Flycatcher, SR
Hammond's Flycatcher, SR, R
Dusky Flycatcher, SR, C
Western Wood Pewee, SR, U
Olive-sided Flycatcher, SR, C
Horned Lark, T, C; SR, U
Violet-green Swallow, SR, C
Tree Swallow, SR, U
Bank Swallow, SR, C
Rough-winged Swallow, SR, U

Knot
Purple Sandpiper
Pectoral Sandpiper*
White-rumped Sandpiper
Baird's Sandpiper
Least Sandpiper*
Curlew Sandpiper
Dunlin*
Short-billed Dowitcher*
Long-billed Dowitcher
Stilt Sandpiper*
Semipalmated Sandpiper*
Western Sandpiper
Buff-breasted Sandpiper
Marbled Godwit
Hudsonian Godwit*
Ruff
Sanderling

AVOCETS and STILTS
American Avocet

Black-legged Kittiwake
Sabine's Gull
Forster's Tern*
Common Tern*
Arctic Tern*
Sandwich Tern
Caspian Tern*
Black Tern*

AUKS, MURRES, and PUFFINS
Razorbill
Thick-billed Murre
Dovekie
Black Guillemot*
Ancient Murrelet

PIGEONS and DOVES
Rock Dove*
White-winged Dove
Mourning Dove*
Passenger Pigeon*

CUCKOOS
Yellow-billed Cuckoo*
Black-billed Cuckoo*

BARN OWLS
Barn Owl*

Here are two examples of check-lists. Left: Banff National Park, Alberta; right: Federation of Ontario Naturalists.

Recording the first spring arrivals or each species is valuable especially if records are kept from year to year. A good way to do this is to keep a *Field Check-list of Birds* for the year. Each bird is listed in family groupings with a space for the date of your record.

7. Ornithologists not only keep a yearly list but also "special day" lists. Perhaps one day each month, record all the birds you see. These records help to show the migration trends from month to month. Peak dates can be noted. To what extent do local weather and food supplies affect records?

8. *Annual Christmas Census.* During a one-day period at the end of the year, bird watchers across North America record all species and numbers of birds seen. This data when compiled gives an overall picture of bird population. The following list was compiled one recent Christmas in the Toronto area.

Greater scaups, 3586
House sparrows, 2551
Herring gulls 2389
Starlings, 1250
Black ducks, 1120
Mallards, 1086
Black-capped chickadees, 863
Oldsquaws, 732
Ring-billed gulls, 681
Slate-colored juncos, 609
Common goldeneyes, 572
Tree sparrows, 552
American goldfinches, 475
Snow buntings, 200
Ring-necked pheasants, 178
Downy woodpeckers, 155
Cardinals, 145
White-breasted nuthatches, 130
Blue jays, 119
Buffleheads, 109
Hairy woodpeckers, 95
Song sparrows, 81
Mourning doves, 67
Common redpolls, 38
Long-eared owls, 29
White-throated sparrows, 24
Sparrow hawks, 24
Red-tailed hawks, 23
Common crows, 22
Golden-crowned kinglets, 21
Redwinged blackbirds, 15
Purple finches, 14
Lesser scaups, 13
Great black-backed gulls, 12
Brown creepers, 12
Glaucous gulls, 11

Canada geese, 10
Great horned owls, 9
Hermit thrushes, 7
Common mergansers, 6
Belted Kingfishers, 6
Winter wrens, 6
Pine siskins, 6
Evening grosbeaks, 6
Swamp sparrows, 6
Rough-legged hawks, 5
Myrtle warblers, 5
Common grackles, 5
American widgeon, 5
Brown-headed cowbirds, 5
Robins, 5
Red-breasted nuthatches, 4
Great blue herons, 4
Ruffed grouse, 4
Oregon juncos, 4
Brown thrashers, 3
Iceland gulls, 2
Yellow-shafted flickers, 2
Pileated woodpeckers, 2
Carolina wrens, 2
Rufous-sided towhees, 2
Brant, 2
Rusty blackbirds, 2
Killdeer, 2
Screech owls, 2

and the following 14 singles—redhead, green-winged teal, Savannah sparrow, mockingbird, goshawk, marsh hawk, red-breasted merganser, sharp-shinned hawk, red-shouldered hawk, red-bellied woodpecker, northern shrike, cedar waxwing, Baltimore oriole, and vesper sparrow.

9. Make a chart to list the birds which stay during the winter months.
10. During spring or fall migration, pick a moonlit night. Focus your binoculars, telescope or balscope on the moon. If you are lucky, you will see migrants as they cross the moon's path of light.

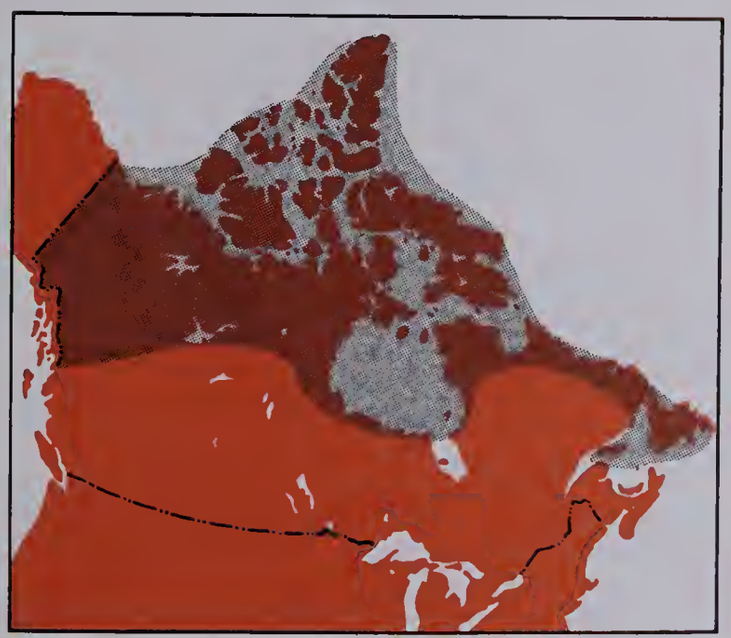
Canada goose *Branta canadensis*

summer permanent winter

ruffed grouse *Bonasa umbellus*

permanent

RANGE MAPS



rock ptarmigan *lagopus mutus*

permanent

1. blue grouse *dendragapus obscurus*
2. woodcock *philohela minor*

1. permanent 2. summer

Chapter 4

BREEDING SEASON

TERRITORY

During spring migration, the male bird usually arrives back first. At once he selects a breeding territory. In this area, mating, nesting and feeding will take place. To announce ownership, he will sing loudly from various perches within his territory. If a member of the same species trespasses across the imaginary boundary lines, the owner gives a verbal warning. A male intruder will be driven away by attack, if he does not pay attention.

Mapping Territories

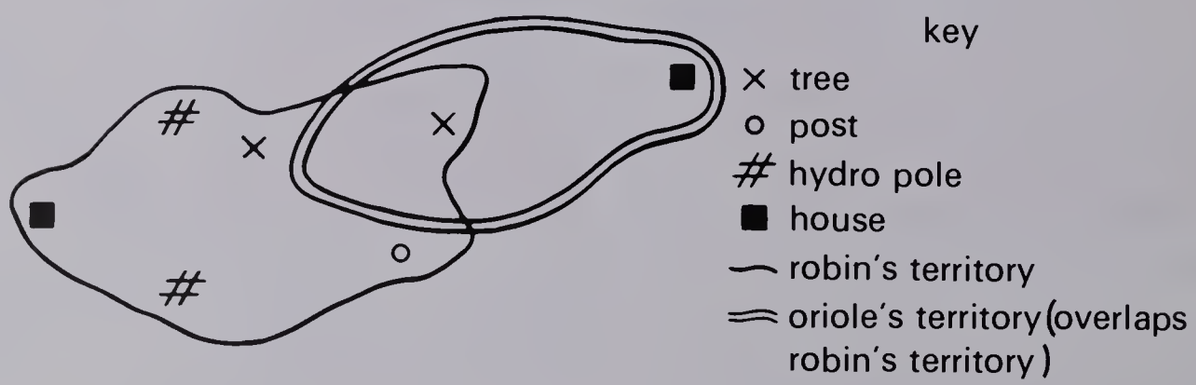
(a) Males have special places which they use as boundary markers for the territory they have claimed. Select an open area where a male robin sings.

(b) Go to the area. Observe and record the places from which he sings. Repeat this activity for several mornings.

(c) The boundary markers you have noted will roughly outline the male's selected territory. Using the suggestions for mapping in *Studies for Open Places*, map the territory.

(d) Repeat this exercise for *neighbouring birds* of the *same* species which border the first territory.

(e) Find and map the territory boundaries of another species (for instance the oriole) *within* the first mapped territory to show the *overlapping* of different species.



Tape Recordings

Taped bird recordings can be very useful in learning about territories. Be reasonable with your experiments and do not interfere often. Limit testing to 15 min at a time. Longer periods are cruel because the birds may become very disturbed and leave their territory. Nests with eggs or young may be abandoned.

You will need:

portable tape recorder

bird record

cardboard bird on stake

toy model of same bird

stuffed bird and another species

If you can use a stuffed bird from a collection or borrow a mounted bird, use it for steps (d) and (e), otherwise omit these steps. The cardinal has been picked for this experiment but you can use any common songster of your area. Make certain that your taped song and imitation model represent the bird you have chosen except in (e).

(a) Use a portable tape recorder to tape the song of a cardinal from a recording. Obtain permission from the record company to make the recordings.

(b) Take the taped song to the domain of a singing cardinal. Plant the cardboard model beside the tape recorder. Switch on the tape recorder and retreat to a nearby hiding place. Observe the reactions of the real cardinal.

(c) Remove the cardboard cardinal. Replace it with a toy model and repeat the activity.

(d) Replace the toy model with a mounted cardinal (if readily available) and repeat the activity.

(e) Substitute a different stuffed species and note the results. What conclusions can you make from the above activities? What reaction do you expect from a bird on territory compared to a different species invading that territory.

Tape Territory Boundaries. Using a portable tape recorder, you can find the same boundaries of a territory as direct observation showed on page 76. When the mounted bird shown with the corresponding tape gets no further response, you are probably outside the territory. Try to locate the boundaries by this method and then complete the mapping exercise. Compare your map from page 76 with this map.

Flight Songs

In many species, particularly those of open places such as large pastures or prairies, the males instead of using a singing perch will give song or call while in mid-air. Such birds as the horned lark, snipe, bobolink and goldfinch give these flight songs. Another excellent example is the American woodcock. This shorebird returns in spring when snow patches still remain.

(a) Go to a damp open place near young trees just as dusk settles.
(b) Listen for the male's well-spaced "peent", a very nasal sound made by the bird on the ground.
(c) Try to locate the source of the sound and watch carefully. Every few minutes, the bird will whir upwards, with wings whistling loudly. At the height of its flight a strange sky dance on wings is performed, then the woodcock drops straight to the ground.
(d) As the "peent" ground call begins again, try to creep in closer to the scene of action. Count the number of ground calls between each aerial display.
(e) Use a flashlight to follow the aerial show.

NESTS

When the female accepts the territory chosen by the male, mating and nesting usually take place at once. Nests are fascinating and vary in size, shape, location and construction materials. Using reference books in your resource centre, complete a duplicate of this chart in your record book.

NEST LOCATION	BIRD	NESTING MATERIALS
holes in trees, fence posts or bird boxes	1	
	2	
on the ground	1	
	2	
holes in the ground	1	
	2	
in trees on branches	1	
	2	
in bushes	1	
	2	

Important: If you find an occupied nest, LEAVE IT ALONE! There are two reasons for this conservation rule. (1) Many birds will desert their nests if disturbed. (2) Predators, some mammals and snakes, will be attracted to the nest if a path leads directly to the location. The nest and contents will then be disturbed.

Suggestions for Nest Studies

MATERIALS.

1. Birds are very clever at hiding their nests, but coloured wool will be used in nest construction if made available. Cut 5 cm lengths of brightly coloured wool and place them on branches in your backyard or a nearby field. Make a ball of end pieces of wool. Place the ball in a bird cage and set it on a table in the yard. A few pieces of wool, woven into a nest will reveal the nest location from a distance.

killdeer

C

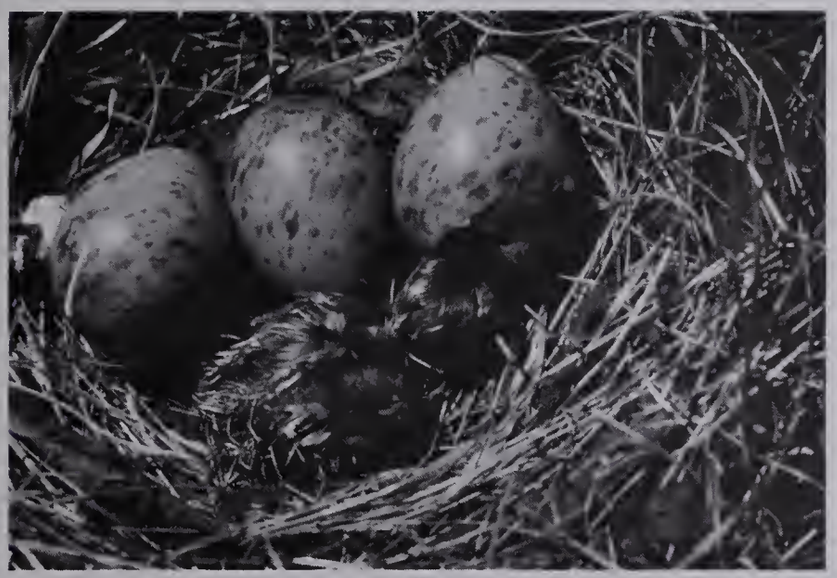
woodcock

A

Puzzle Pages

Match the nest with the correct bird.

1. What type of site does each species prefer?
2. What is the special way in which a shrike uses a thorn tree for its nest?



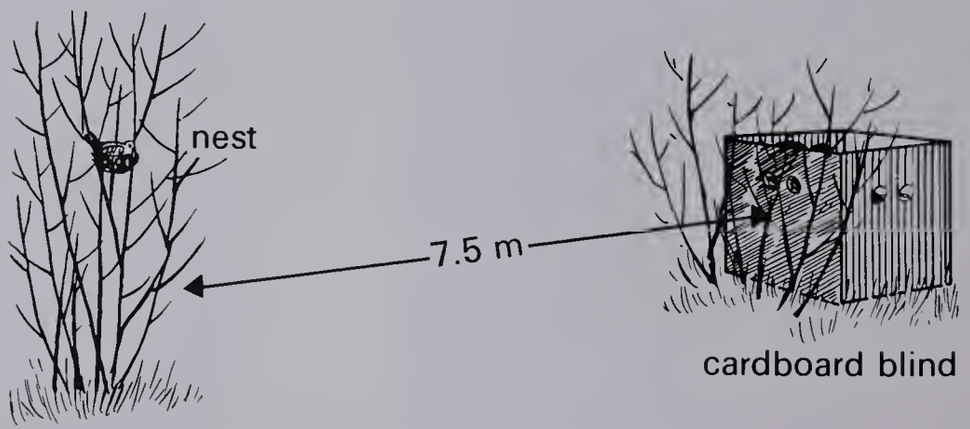
B

gull

D

great blue heron

2. *Nest Observations*. Would you like a front-row seat from which to observe birds building their nests? Then make a blind. Find a cardboard carton large enough for you to sit inside. Cut peep holes the size of binocular eye pieces. Place the blind about 7.5 m from the nest, and camouflage it with powdered tempera paints. From inside the blind, record your observations.



(a) What building materials are used?
(b) Where is the material collected?
(c) Do both sexes assist in nest construction?
(d) Tabulate how many trips were made to the nesting site with materials during 15 min periods.
(e) During which part of the day is nest-building activity the greatest?
(f) How long does it take to complete a nest?
(g) How far away is the male's song post?
(h) Does he get involved in territorial disputes?

Similar observations can be made at bird boxes.

3. *Record Schemes*. Canada has six such programmes in operation:

Pacific Nest Records Scheme.
Prairie Nest Records Scheme.
Ontario Nest Records Scheme.
Quebec Nest Records Card Program.
Maritimes Nest Records Scheme.
Newfoundland and Labrador Nest Records Scheme.

In the United States, there are similar state schemes. All the data collected from these various schemes is fed into a North American Nest Record Program. Boys and girls may work with adult ornithologists on these schemes. Is there a naturalist in your area *you* might assist? Your records from exercise 2 on page 82 may be the beginnings of exciting scientific studies.

ONTARIO NEST RECORDS SCHEME – ROYAL ONTARIO MUSEUM & CANADIAN WILDLIFE SERVICE

A.O.U. No.	SPECIES					( ) Mark "X" for COWBIRD USE, and fill out separate card for Cowbird (see instructions)	YEAR
Date (Write out month)	Time	Eggs	Young		Comments, or Cowbird data		
					(See "Outcome" – Over)		

Name and address of observer

COUNTY
Nearest Town
Locality

Altitude

HABITAT (mark one or more, & give details)

( ) Buildings
( ) Garden
( ) Farmland
( ) Woodland
( ) Marsh
( ) Small island

NEST DESCRIPTION Ht. from ground..... m

Material:

Position:

Nest Record Card. Cards are kept on very common birds as well as rare species. Do you know the trick the cowbird plays? It does not make its own nest, but prefers to use the often crowded nests of other birds. A song sparrow's nest with one egg of the song sparrow and 10 of the cowbird

has been found. In another case a yellow warbler made a five-storey nest to protect its own young from the parasitic cowbird. Over 90 species of birds are victimized by the cowbird. Find out who are some of these victims.

4. *Collecting*. Winter is the *only* time that humans can interfere with bird nests without upsetting a bird's nesting rhythm. Winter plays havoc with even the most carefully constructed nests. Eagles and hawks that return to the

same nest year after year, often have major repair jobs to do in the spring. There is no law against nest collecting in the fall, since almost all bird species build a completely new nest each year.

(a) Obtain permission before you collect nests from a neighbour's property.

(b) Collecting should be done during late fall or early winter after the leaves have fallen.

(c) When collecting, sketch the place where the nest was found: in a shrub, on a branch, and so on. In a few cases the nest will be tightly attached to a branch, so you will have to cut off the branch as well.

(d) Label each nest neatly. "Where found" should include the height of the nest from the ground, the type of terrain, as well as the postal address.

name: _____

date: _____

where found: _____

collector's name: _____

5. *Dissection.* If a class works in small groups, several kinds of nests can be dealt with at one time.

(a) Measure the circumference, diameter and depth of the nest.

(b) Record the mass of the nest.

(c) Carefully dissect the nest, observing its intricate construction. Sketches will be useful.

(d) Sort out and classify materials.

(e) Devise a bar graph to show the quantity of these various materials.

(f) In your studies on adaptations, you have seen how birds use only their bill and feet as tools in nest construction. Use the above materials, and try to reconstruct a nest. How do your hands compare with bills and feet as tools for this job?

(g) Compare the size, weight and nesting materials of the various nests being dissected in the class.

(h) Keep remains of nests in plastic bags in the classroom. After about 10 d, check for insects and mites. These will be parasitic on birds.

BUILDING BIRDHOUSES

Have you ever watched a snowball grow? Good ideas sometimes do the same.

A third and fourth year class and a special opportunity class started a project to save the vanishing bluebirds in their area. On March 2, 1968, five carloads of pupils left their school to put up the 25 bluebird houses that the classes had made. Along with the 20 pupils and their teacher went nine members of the local naturalist club. This co-operation led to great things, as enthusiastic members decided to continue the

BLUEBIRD HOUSE PROJECT

year	bird	total nests	fledged young	successful nests	unsuccessful nests
1968	bluebird	10	22	6	4
	tree swallow	11	23	6	5
	house wren	1	7	1	—
1969	bluebird	90	153	37	53
	tree swallow	69	120	25	44
	house wren	12	35	9	3
	black-capped chickadee	3	12	2	1

idea. By the spring of 1969, the Willow Beach Naturalist Club had not only 25 houses but 225 bluebird boxes ready for the birds. Each house was numbered so that records for the Nest Records Scheme could be kept.

Note: The increase in unsuccessful nests in 1969 was due to cat predation. By July 1, 1970, 96 bluebird nests had been recorded. Of these, only 13 were unsuccessful. Do you think that the new tin protectors have been effective?

Types of Birdhouses

Design a house for a *particular* bird.
Use wood. Avoid metal because of the danger from heat.
Ventilate and drain the house well.
Fit roof pieces tightly to prevent rain from soaking the nest.
Allow roof overhang of 5 cm to protect the entrance hole.
Stain or paint the house with soft, dull colours.
Leave the inside rough. Do not put in a perch.

BIRDHOUSE DIMENSIONS

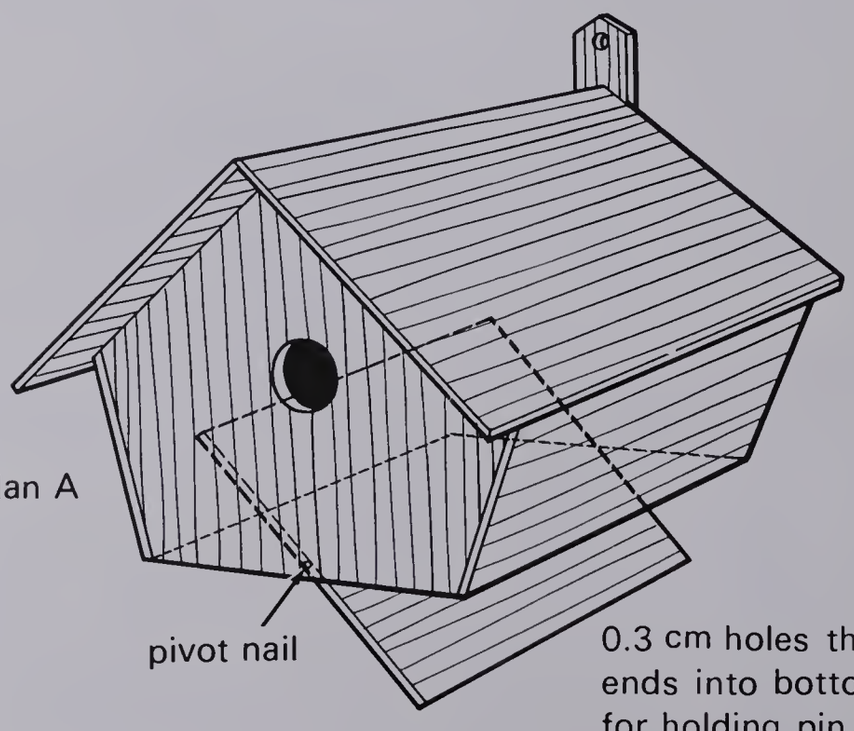
single room houses	floor size (cm)	depth inside (cm)	entrance from floor to opening (cm)	diameter of entrance (cm)	height of house from ground (m)
house wren	10×10	15 –20	10 –15	2.2	2 – 3
tree swallow	13×13	15	13 –15	4	3 – 5
bluebird	13×13	20	15	4	1.5 – 3
crested flycatcher	15×15	20 – 25	20	5	2.4 – 6
flicker	18×18	40 – 45	35 – 40	6.25	2 – 6
screech owl sparrow hawk	20× 20	30 – 40	22 – 30	7.5	3 – 9
apartments purple martin	15×15	15	2.5	6.3	4 – 6

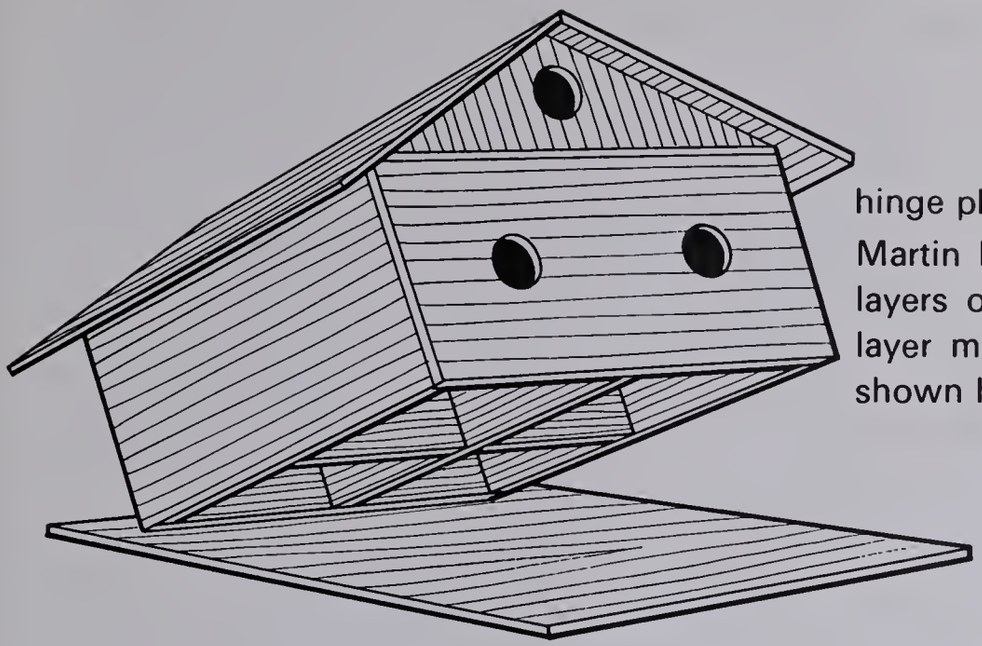
Be certain your houses are easy to clean. Each fall old nests and debris should be removed. Here are three plans to simplify this task.

Pivot, Plan A. The bottom is held in place by two nails; one in the middle of each end piece. A pin is inserted in the hole on one side to hold the bottom in place.

Hinge, Plan B. In a martin house, each section is hinged. Hinges are placed either on end or side. The opposite end or side is fastened with a hook.

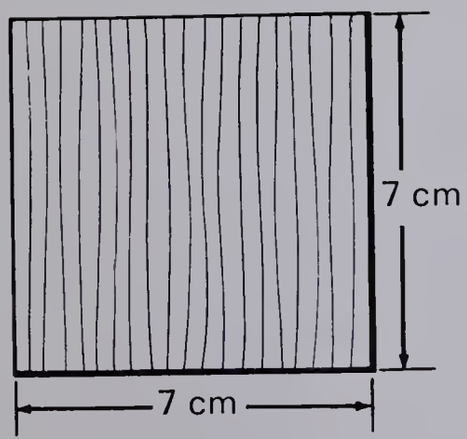
Removable Floor, Plan C. The 7 cm floor is turned diagonally to fit into a 5 cm square floor opening. Repeat to remove floor. Another good removable floor plan is the type where the floor board slides forward and out.



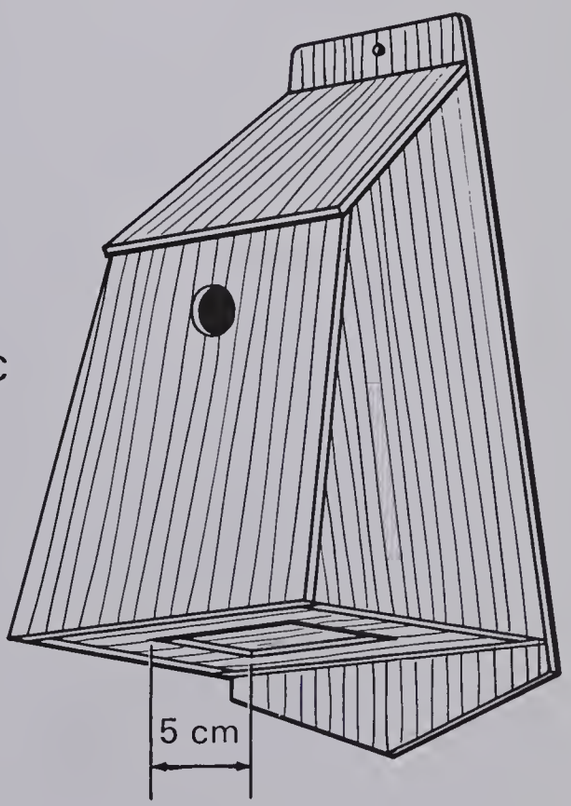


hinge plan B

Martin houses usually have several layers of these "apartments". Each layer must have entrance holes as shown here.



removable floor plan C



Two Bluebird Houses

MATERIALS

Front and back

2 of A—1.6 cm x 17.5 cm x 22.5 cm

Sides

2 of B—0.6 cm x 7.5 cm x 15.6 cm

Bottom

1 of C—1.6 cm x 12.5 cm x 12.5 cm

Roof

8 of D—0.6 cm x 7.5 cm x 20 cm

Support

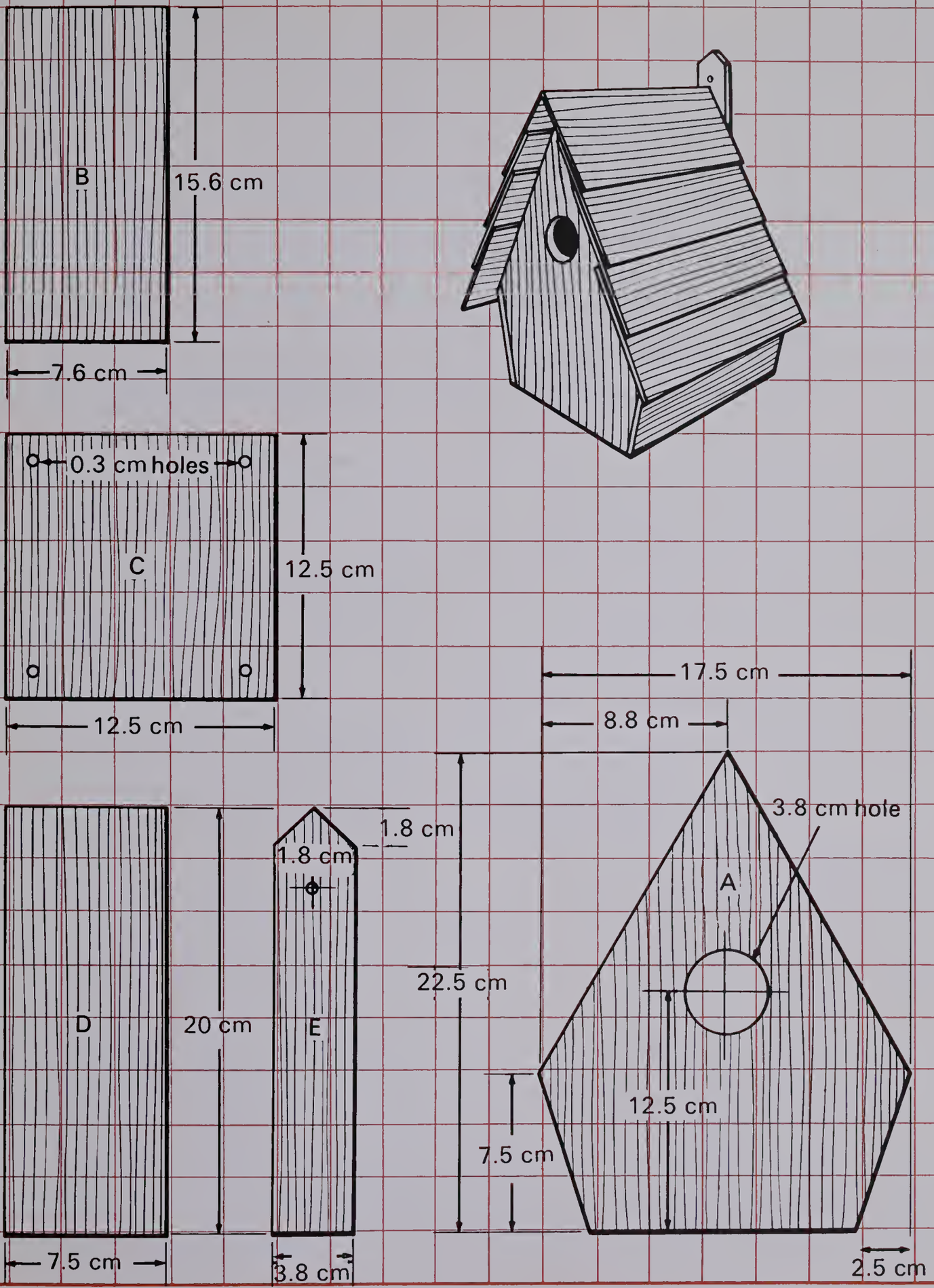
1 of E—1.6 cm x 3.8 cm x 20 cm

A, C, E are made from an orange crate or grape box ends, B and D from sides.

METHOD.

1. Saw out the front and back.
2. Lay out the remaining parts, B, C, D, E and cut to size.
3. Bore entrance and drainage holes.
4. Nail sides B to front and back A. Plane the bottom and top edges of each side to the same angle as the bottom and roof respectively.
5. Bevel opposite edges of bottom, so it will swing on pivots, which are 3.8 cm finishing nails, through the lower centre of front and back pieces. See Plan A.
6. Drill 0.3 cm hole through one side and into the bottom for a pin to hold the bottom in place.
7. Nail on the roof slats so edges overlap as in the picture. The top two slats meet at the ridge, so they fit together neatly. The back end of the roof slats are flush with the rear of the house, allowing all the overhang to be at the front of the house.
8. Nail the support E to the back, so that it extends 5 cm above the roof.

One square equals 2.5 cm



MATERIALS

Front

1 of A—1.6 cm x 16.3 cm x 19.4 cm

Sides

2 of B—1.6 cm x 12.5 cm x 23 cm

Bottom

1 of C—1.6 cm x 12.5 cm x 13 cm

Back

1 of D—1.6 cm x 17.5 cm x 32.5 cm

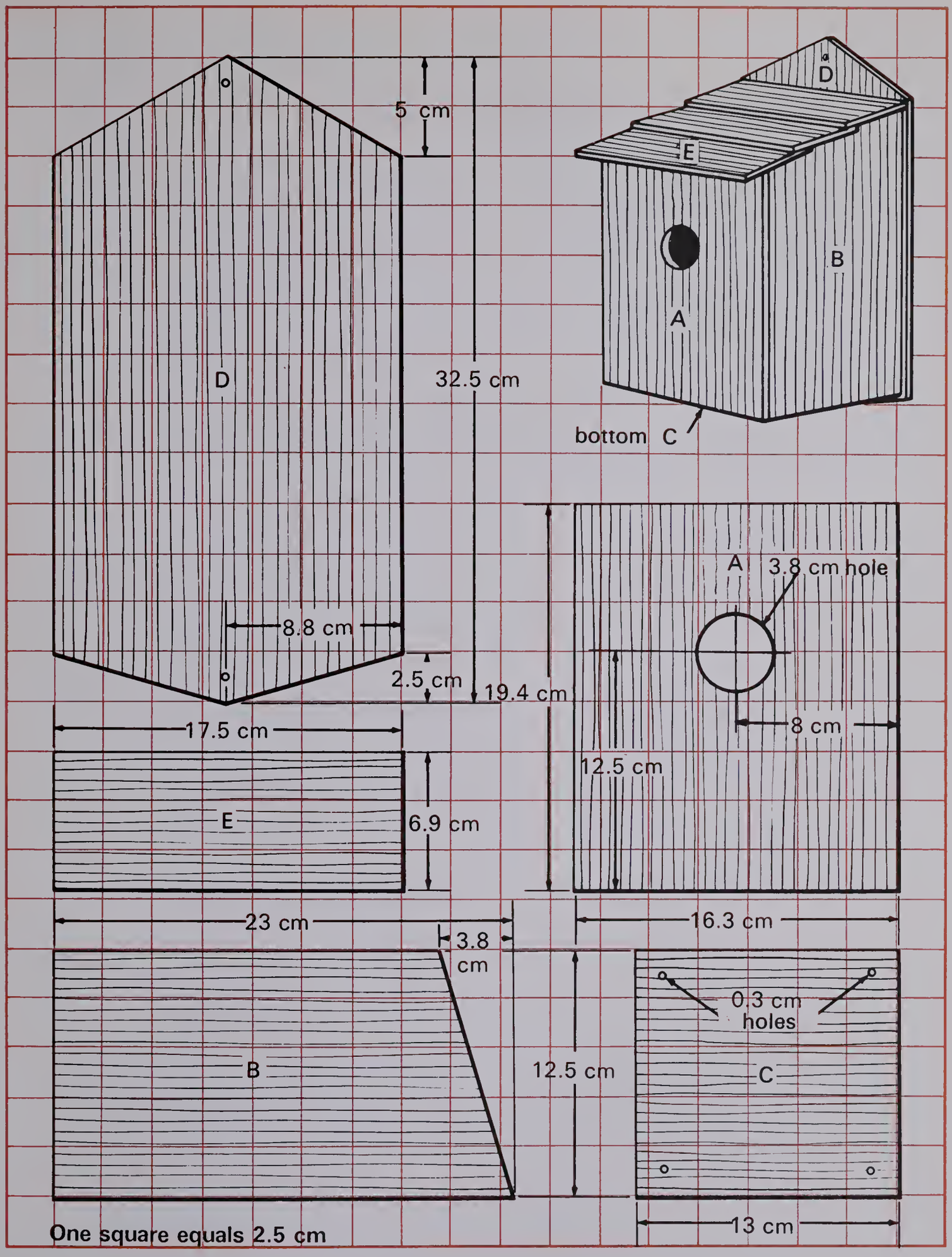
Roof

3 of E—0.6 cm x 7 cm x 17.5 cm

A, B, C and D are made from ends of orange crate or grape box. Roof E is made from the sides.

METHOD

1. Cut out all the parts.
2. Bore entrance and drainage holes.
3. Nail the bottom C to the sides B so one edge will drop down for cleaning, as in Plan A. Removable floor plan C can be used on this house.
4. Nail the front to sides B.
5. Nail the back D to the sides.
6. Drill a 0.3 cm hole through one side and into the bottom for a pin to hold bottom C in place.
7. Bevel the top edge of front A to the same angle as the sides.
8. Nail on the roof slats E, overlapping them like shingles.


5 cm
32.5 cm
D
8.8 cm
2.5 cm
19.4 cm
17.5 cm
E
6.9 cm
23 cm
3.8 cm
B
12.5 cm
D
E
B
A
bottom C
A
3.8 cm hole
8 cm
12.5 cm
16.3 cm
0.3 cm holes
C
13 cm
One square equals 2.5 cm

Tree Swallow House

MATERIALS

Front and back
2 of A—1.6 cm x 17.5 cm x 17.5 cm

Sides
2 of B—0.6 cm x 7.5 cm x 15.6 cm

Roof
4 of C—0.6 cm x 7.5 cm x 20 cm

Bottom
1 of D—1.6 cm x 12.5 cm x 12.5 cm

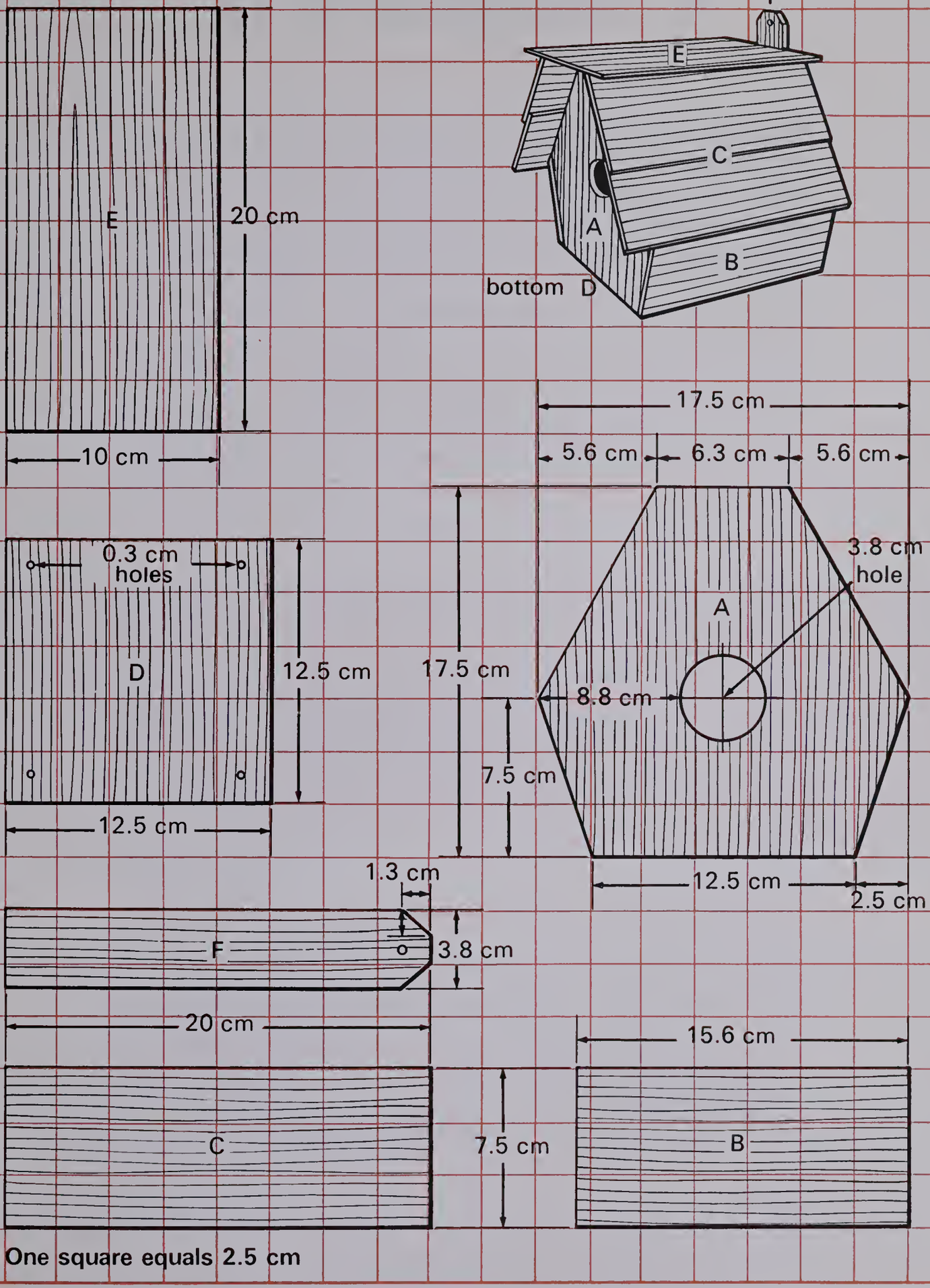
Deck
1 of E—0.6 cm x 10 cm x 20 cm

Support
1 of F—1.6 cm x 3.8 cm x 20 cm

A, D, F are made from an orange crate or grape box ends, B, C and E from the sides.

METHOD

1. Saw out all parts.
2. Bore entrance and drainage holes.
3. Nail sides B to the front and back A. Plane the bottom and top edges of each side to the same angle as bottom and roof respectively.
4. Bevel opposite edges of the bottom, so it will swing on pivots which are 3.8 cm finishing nails through the lower centre of front and back pieces. See Plan A.
5. Drill a 0.3 cm hole through one side and into the bottom for a holding pin to be inserted to hold the bottom in place.
6. Nail the roof slats C in place so that they overlap each other. Back ends of the roof slats are flush with the rear of the house, allowing all the overhang to be at the front of the house.
7. Nail the deck piece E on top. Centre it carefully so that the same overhang is on either side.
8. Nail the support F to the back, so that it extends 5 cm above the deck piece.
   Place the house so that no trees obstruct the approach flight of the swallow.


F
E
C
A
B
bottom D
E
20 cm
10 cm
17.5 cm
5.6 cm
6.3 cm
5.6 cm
0.3 cm
holes
D
12.5 cm
3.8 cm
hole
A
17.5 cm
8.8 cm
7.5 cm
12.5 cm
1.3 cm
12.5 cm
2.5 cm
F
3.8 cm
20 cm
15.6 cm
C
7.5 cm
B
One square equals 2.5 cm

Chapter 5

BIRD PHOTOGRAPHY

Photography is a hobby that allows you to share your experiences with others. Bird photography, in particular, presents a big challenge. Although there is no closed season and no bag limit, one must develop patience and the skill of stalking. Results can be a scientific record to illustrate field notes.

BASIC GUIDE

1. In all cases, the *safety* of the subject is the key point. For this reason, nest photography must be left to advanced photographers. This chapter contains only hints for the beginner, and not rules that should be followed every time.

2. Know the special habits of the bird you are photographing. Look back to pages 11 to 23 for the "S" system key.
3. Know your camera.
4. Be patient!
5. Receive permission to use private property.

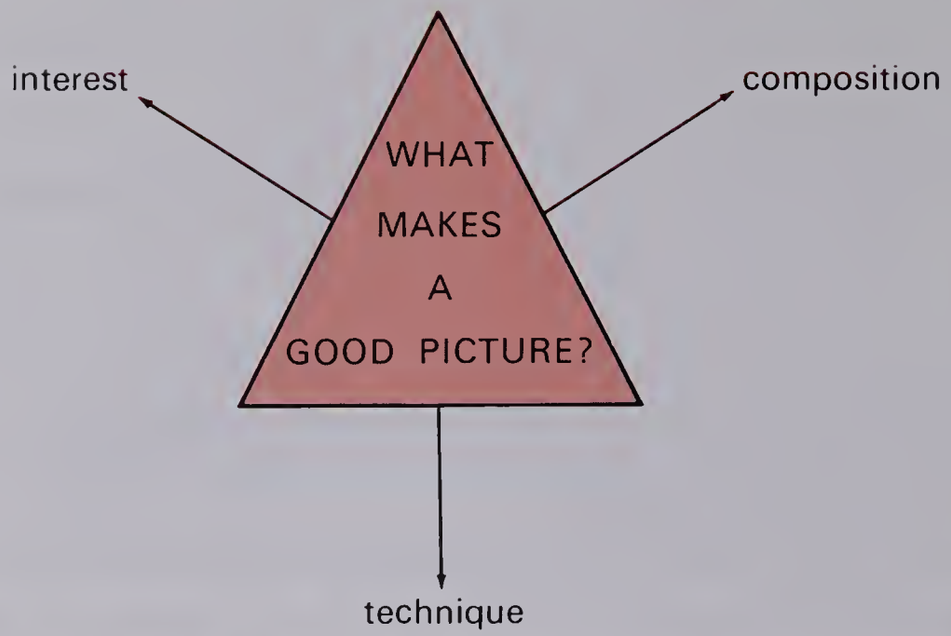
BEGINNER'S EQUIPMENT

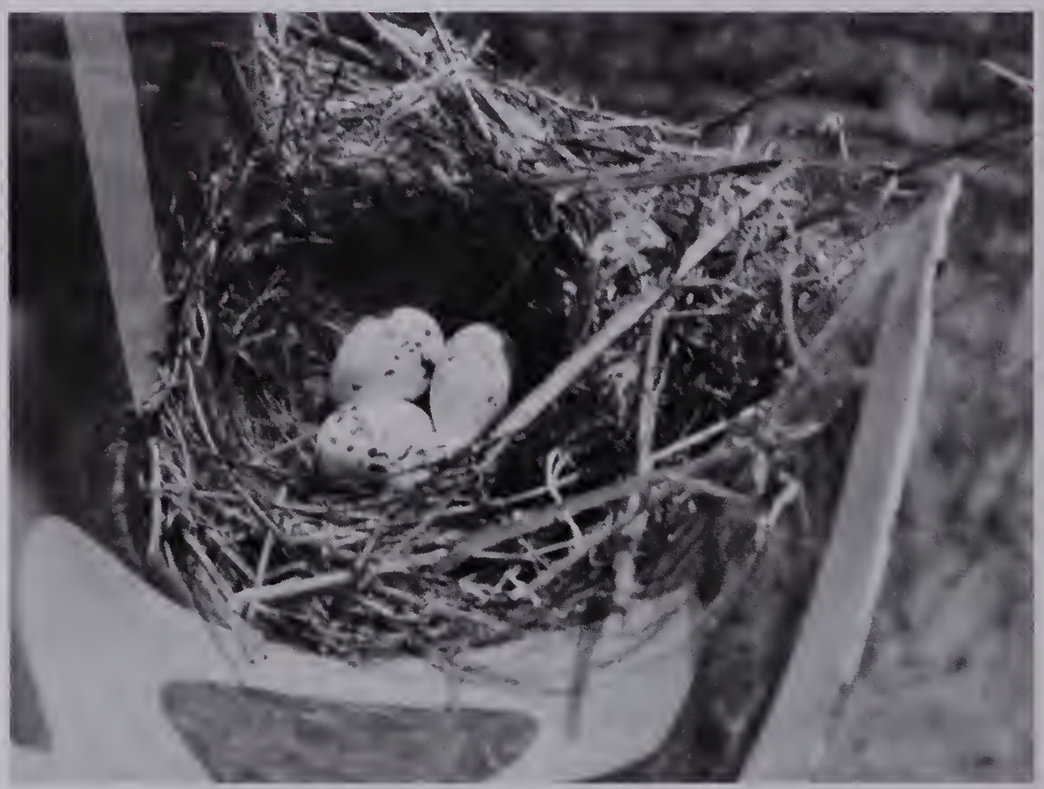
1. Camera. What is a camera? A camera is a light-tight box that holds light-sensitive film. When light enters the box for a set time, the film is exposed.
   Cameras range from simple, inexpensive models to those which are very complex and costly. Some students will have a polaroid type of camera, able to produce a fully developed picture a few seconds after it has been taken. Let us assume that you have an inexpensive camera, such as a simple box camera. Since colour prints and slides are expensive, perhaps you will be more interested in black and white prints. To get started, a camera and film are all you need.
2. Record Book. Good photographers record where, when and how a picture is taken.

	DATE	SUBJECT	LOCATION	TIME	LIGHT	F-STOP	SPEED	DISTANCE	FILM
1	April 19, 19--	bluebird house	Oak Lake	09:15	bright sun	5.6	1/50	3 m	B.&W.

3. Binoculars. These help to locate and follow a subject.
4. A tripod is a "must" if you want to close your shutter by remote control. To do this, place the camera on a tripod, fasten a fine fishing line to the release button and retreat to a hiding place.
5. Blind. See page 82 for suggestions on how to make one.
6. Reflected light. A mirror, a piece of white paper or crumpled up aluminum foil can be used to reflect light onto a subject in the shadows.

HOW TO GET GOOD RESULTS





Can birds read? A pair of kingbirds found this damaged traffic "STOP" sign, obeyed the order and made their home in the sign.

Interest

The photograph opposite interests you at once, because it tells a story. We say it has *impact*.

Before you shoot a picture, ask yourself:

(a) does it have impact?
(b) why am I taking this picture?
(c) what interests me in this picture?

Composition

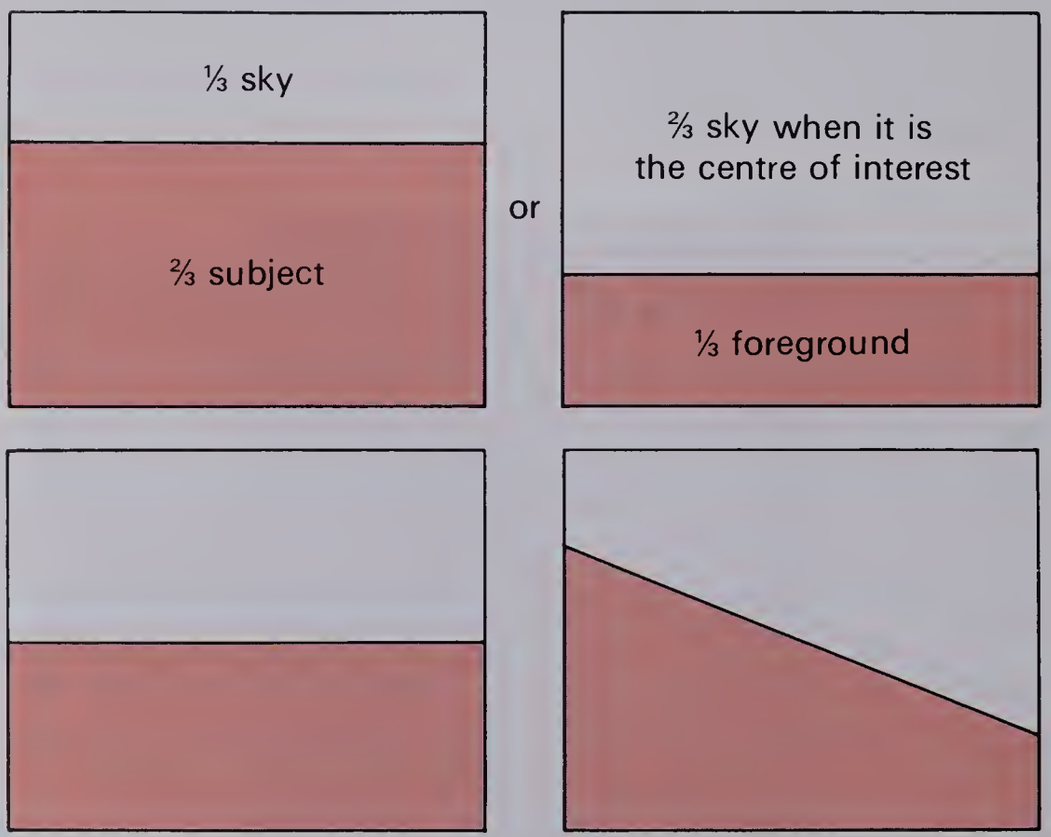
Remember: a well-composed shot requires common sense. On an inexpensive camera the viewfinder will not always show you the exact picture you will take. This is due to parallax. After you have developed your first film, you will see what adjustment is necessary.

Centre of Interest. What is the most important object in this picture? Try to have the centre of interest in a picture well placed. Notice how all lines in this photograph lead the eye to the centre of interest.

The *colour arrangement* tends to focus attention on the centre of interest.

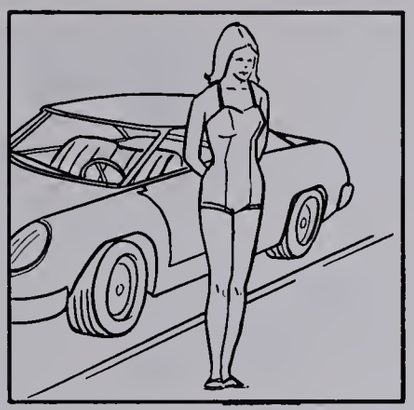
Describe the *background* in this picture. Backgrounds should be simple, to emphasize the centre of interest. Cluttered backgrounds make a "busy" picture with no one centre of interest. As you would do in sketching, try to fill the whole frame with interesting material.

Balance. Try to *balance* your picture with the centre of interest or main subject taking up about two thirds of the picture.

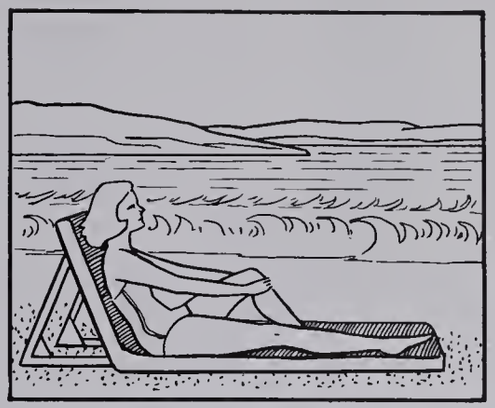


Lines. The horizon lines in (a) and (b) are samples of poor composition. In (a) the horizon cuts the picture exactly into [redacted] ? What is wrong about the horizon in (b) ? Remember to place your horizon line to fit the rules of *good balance*. Avoid lines cutting a picture into parts (telephone poles, wires and so on).

Harmony. This means that a picture's parts are tied together to give a pleasing result.



poor harmony



good harmony

Framing. Distant scenery shots have more impact if the picture is framed.

Mergers. Avoid mergers by checking foreground subjects against the background.

Natural Photographs. Which picture looks better? Why?

Strong composition forms in a picture are:

Movement. If the bird is moving, allow it room to move in the direction of motion. Note the open space the geese have to fly toward.

Technique

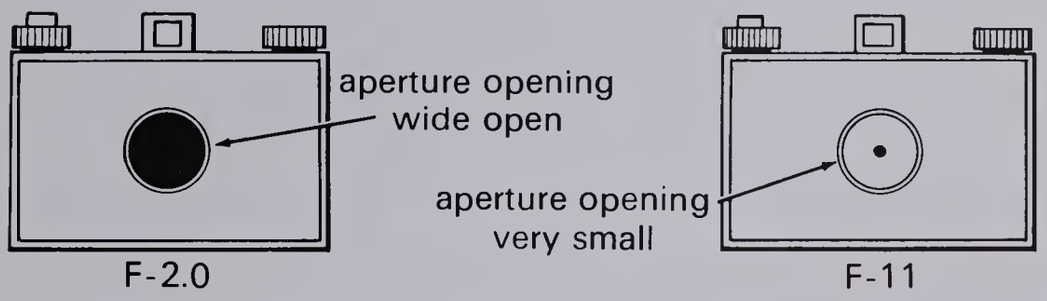
Exposure. Is the picture too dark, too light, or just right? Exposure depends on *diaphragm aperture* (opening) and *shutter speed.*

Diaphragm Aperture. The amount of light reaching the film is controlled by the size of the opening or *aperture* of the *diaphragm.*

This opening can be compared to the pupil, the black part of your eye; the larger the hole, the more light enters and the smaller the hole, the less light enters. Numbers on the camera, called F-stops, represent the various sizes of openings. These are:

2:0, 2.8, 3.5, 4, 5.6, 11, 16, 22, 32.

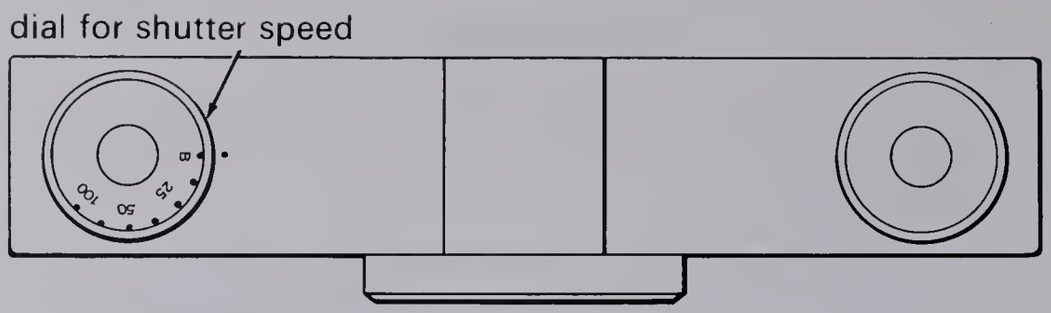
Few cameras have all the numbers. The smaller the F-stop number, the larger is the opening.



Remember to shoot with the sun behind you, not shining into the lens. Why?

Shutter Speed. The amount of light reaching the film is also controlled by the length of time the shutter stays open.

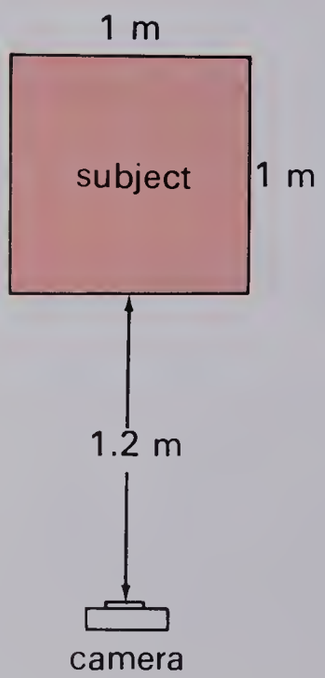
Numbers on the camera showing the various shutter speeds are often 100, 50, 25, B, meaning 1/100, 1/50, 1/25 s, and bulb. Which of these speeds is the fastest and which is the slowest? Which of these speeds allows the least light to enter the camera?

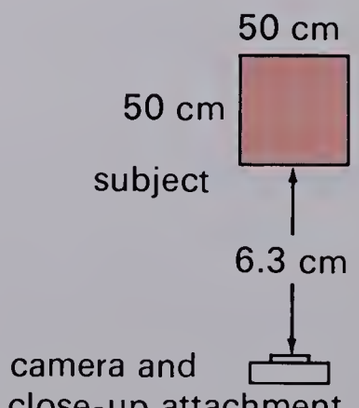


Your camera may have a fixed aperture and shutter speed. If not, you will have to learn to use the right combination of aperture and shutter speed, in order to obtain a well-exposed picture.

Focus. To get a sharp, clear picture it must be in focus. Why are some pictures fuzzy and not sharp?

(a) Pictures must be focused carefully. If your camera does not have a range finder, learn to estimate the distance from subject to camera carefully. Practise pacing off distances until you are reasonably accurate. Most inexpensive cameras will not focus closer than 1.2 m to the subject. The smallest area at this distance will be one metre by one metre.





A close-up attachment over the regular lens will allow you to reduce your distance to 0.8 m and photograph a subject area of 50 cm by 50 cm.

(b) The second common fault of a fuzzy picture is *camera movement*. Hold the camera steady with both hands. At the moment of exposure (the time when you press the button), brace your arms to your sides and the camera against your head (or chest if it is a box camera). Do not try to hand-hold a camera under 1/50 s. Often a fence post, gate or car may be used as a temporary tripod to help steady the camera if a slower speed is needed.

Tips of the Trade

Stalking. How do you move in close to a bird? Yes, very slowly and the instant the bird appears to be alarmed, freeze, then gradually move forward again. Avoid jerky, quick movements. Many birds do not mind people being close to them but are frightened by sudden movements.

Blinds. When you are using a blind, ask a friend to enter the blind with you and then have him leave alone. If the photographer remains silent inside the blind, the birds do not appear to be aware that someone is still there.

Feeders. Keep feeder appearance simple. For instance, a woodpecker on a rustic log looks natural. Place only small amounts of food on the feeder.

Final Word. Just before you snap the picture, hiss or snap your fingers. The bird will tend to freeze for an instant.

Things to Do

1. Make and use a pinhole camera.
2. Prepare a picture story of such activities as:
   (a) making birdhouses.
   (b) making suet dixie cup feeders.
   (c) working at the toothpick camouflage game.

(d) construction of an electric game board.

These projects each involve several steps. Make a photographic record of the process, step by step.

NO.	INTEREST	COMPOSITION	TECHNIQUE	TOTAL

3. Hold a photographic competition. Encourage each pupil to enter his best two pictures. Let all competitors judge the pictures. Each person is handed a judging sheet and each picture is given a number. Under the columns Interest, Composition and Technique, each judge enters a number from 1 to 5. A low mark is 1 and 5 is an excellent mark. A good picture might obtain a total of 10, remembering that 3 is an average in any one category. (If each participant marks his own picture 15, this will make it fair for all entrants!) When the judging is over, the totals for each picture are added and the top three pictures are selected. It is helpful for each picture to be shown and constructive criticism given by the complete group.
4. Make and operate a class darkroom.
5. Form a photography club and ask interested people in the community to assist.
6. Photograph typical sites where birds are found. Prepare a card to go with each photograph, listing the date and species seen.

An excerpt from

Print of the Sandpiper

The three-pronged print the sandpiper traced
into the sand before we came along,
is as firm, as definite a mark
as any of us will leave
on the hard sand of our world.

In an hour the tide will be in,
and after it's gone the sand will be unmarked
and fresh, only sea's touch on it,
even the tread of the sandpiper
smoothed away by that effortless hand.

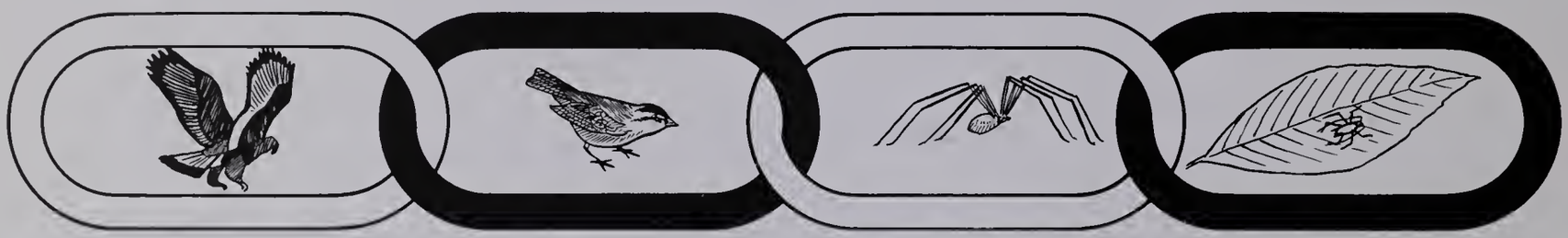
Raymond Souster

Chapter 6

INTER-RELATIONSHIPS

FOOD-CHAIN CYCLES

Every form of life depends on other living things. No living thing is wasted or lost as it gradually returns to the soil after death. Soil is one of the main requirements for growth of more plants or animals. People who study the role each living thing plays in the continuously moving circuit, call the process a *"food-chain cycle"*. In the following example, study how each animal in a link is dependent on another animal or a plant for survival.

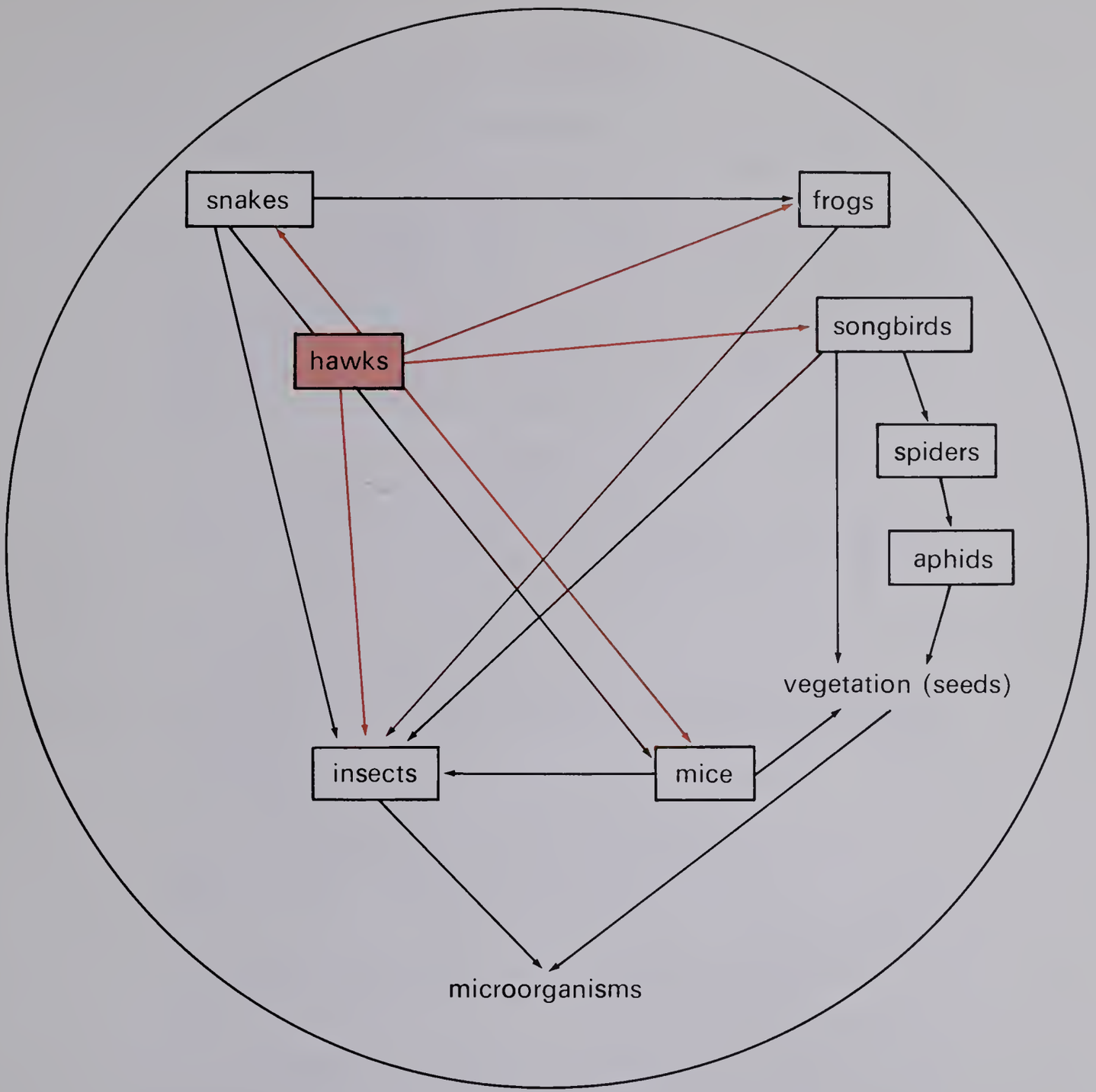


hawk songbird spider aphid on leaf

The hawk eats the songbird, which eats the spider, which in turn eats the aphid, which feeds on the leaf of a plant. The plant grows in the soil. If the hawk dies of old age it will be eaten by scavenger beetles and finally its remains will go back into the food-chain cycle. How?

Food Web

Each animal represented by a link in a food chain eats a variety of foods. If these animals and their predators are linked together in one picture, the result is a *food web*.



Usually it takes a great number of small things (microorganisms, seeds, insects) to feed the large number of medium-sized things (mice, snakes, frogs, songbirds), and these are needed to keep alive such larger animals as hawks. Very few predators are needed to keep all the others in control.

Things to Do

1. Make food-chains, using the following birds as top links in the chain.
   (a) Great horned owl.
   (b) Great blue heron.
   (c) Northern shrike.
   (d) Mallard duck.
   (e) Osprey.
   (f) Bald eagle.
2. Develop a food web from one of the above food-chains.
3. School yards are good places for studying food-chains and webs. Observe the plants and animals there, and try to see how each is related to the others. Each pupil should observe a few links of several food-chains. Return to the classroom and share the observations of the entire class to make a food web chart of your school yard.
4. *Food-chain Relay Game.* Divide the class into teams of even numbers with not more than 10 on a team.

   (a) Each team places numbers from 1 to 10 on the board.
   (b) Team members line up 6 feet from the blackboard.
   (c) At a signal, the leader of each team dashes to the board and writes the name of a plant or animal opposite number 1; then he returns to his team and passes his chalk to the second team player.
   (d) The second player goes to the board and writes the name of a living thing that number 1 plant or animal eats.
   (e) The chalk is passed to the third player who writes the name of something that eats what is written by number 2.
   (f) Continue until all 10 players have had a turn.
   (g) If a player writes an incorrect name the next player can erase it but loses his turn to write a name.
   (h) Score one point for each correct link in the column's chain. An incorrect link loses one point. Do not forget animals such as predators, scavengers or parasites.

5. Play the game again but limit the habitat or site to a marsh, meadow, wood or ocean. Work out variations for the game with limitations such as season of the year or time of the day.

LIFE CYCLE

Chapter 4 introduced many facts about the courtship habits of breeding birds. When nest building is complete, the female lays a clutch of eggs and incubation begins. Incubation is the warming and care given to the egg as the young bird develops inside the shell. Use your resource centre to research information about reproduction of birds.

Points to Consider

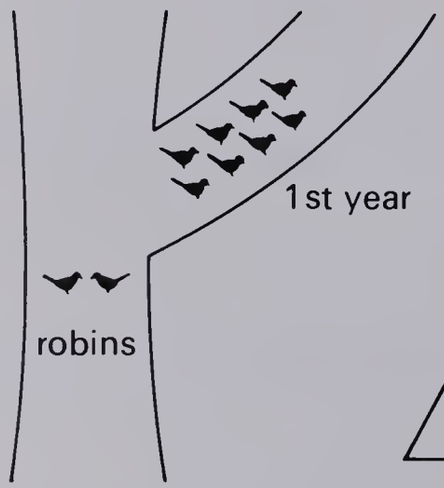
1. Which bird lays the smallest egg?
2. Make a list of species in the animal kingdom that lay eggs.
3. How many clutches of eggs do birds in your area lay each year?
4. What colour are eggs that are laid in burrows or tree cavities? Why?
5. Does the size of clutch vary from one species to another species? Compare the hummingbird's clutch to a black duck's clutch.
6. When do birds begin to incubate eggs?
7. Do both sexes help to incubate the eggs?
8. What is meant by "brood patch"?
9. The longest incubation period of a North American bird is the 48 to 54 d it takes for a Leach's petrel to hatch. What is the average incubation period?
10. How do birds turn eggs during the incubation period?
11. When young birds hatch they are either:
    (a) covered with down, with their eyes open and able to run around as soon as dried after hatching; or
    (b) blind, naked and helpless.
    Give two examples of each class.
12. How do most birds keep their nest clean during the nesting period? Find exceptions to this rule.

REPRODUCTION RATE

Bird population is controlled by nature. The annual death rate varies from 60% to 85%, depending on the species. We know that a pair of robins usually has 4 eggs per brood and breeds twice a year. If all the young live and the offspring are equally divided between male and female, how many robins will be born in the second and third years?

Show the results by one of the following methods.

1.



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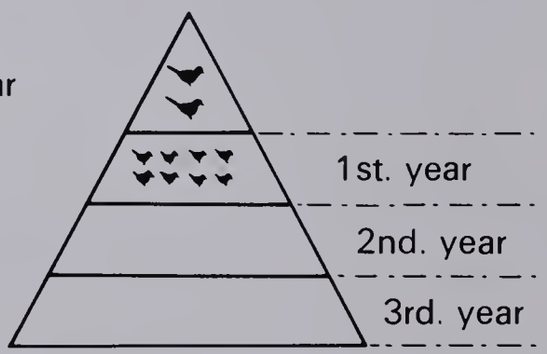
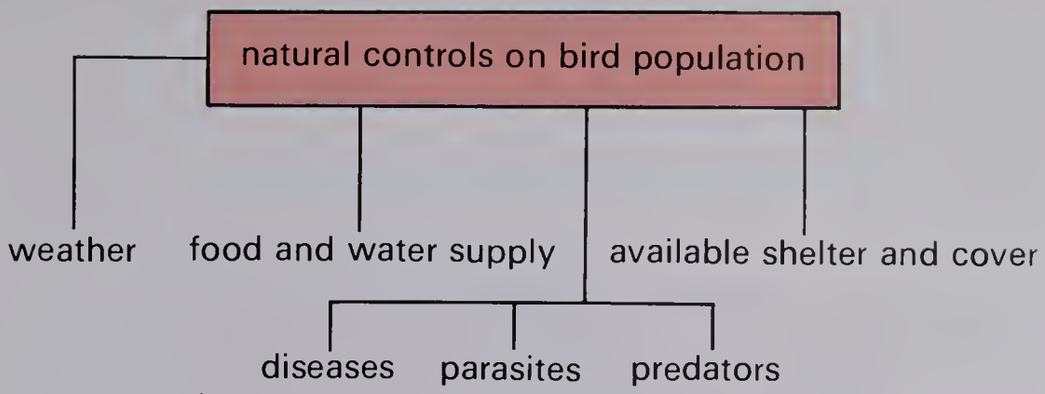


Nature does not permit this to happen, as 80%, or 8 out of 10, die for various reasons.

At the end of the year two robins will be alive, so the population remains constant.



Points to Consider

1. Foggy weather causes a particular problem during migration. Explain.
2. Show a relationship between food supply and territories that birds establish.
3. What bird parasite is a menace to small songbirds? How does the yellow warbler try to overcome this problem?
4. Natural predators wipe out the weak and aged. This ensures the survival of the strongest. List four natural predators of birds.

MAN AND BIRDS

Extinction is Final

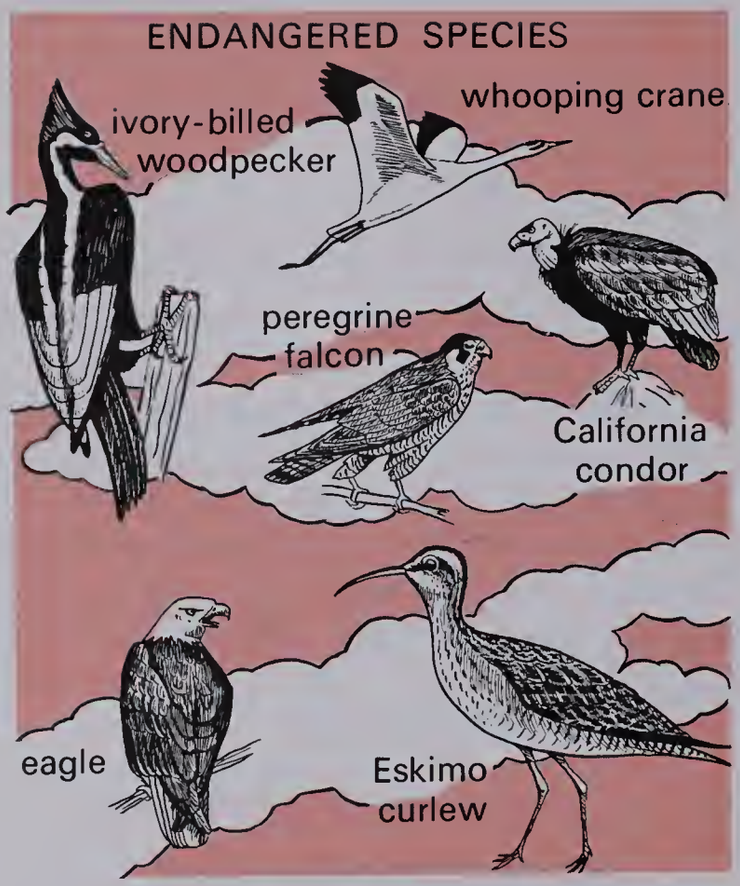
Bird population tends to be kept in check by these natural controls. However, the delicate balance may be upset in a hurry by man.

extinction is—FINAL

North American Birds

1. great auk
2. Labrador duck
3. Carolina parakeet
4. heath hen
5. passenger pigeon

The numbers of many other birds are declining very seriously.



DANGERS TO BIRDS CAUSED BY MAN

- hunting
- loss of habitat
- chemical insecticides
- oil pollution

Hunting

For many centuries hunting was an important part of Canadian life and still is with some Eskimos and Indians. Why? Today hunting is generally considered to be a sport. Unlike natural predators, man tends to kill healthy specimens. It is important that hunting be controlled carefully by government laws.

Migratory Birds Convention Act. In this international agreement, Canada, the United States and Mexico decided to cooperate in protecting birds that migrate across the North American continent. Here are three of the laws in this Act.

1. Most migratory, insect-eating birds are protected during all seasons.
2. There are open and closed seasons for hunting migratory game birds.
3. All migratory, non-game birds are protected unless the government decides that a species is harmful in a particular area.

It is interesting to note that the reproduction rates of game birds and their survival largely determine the length of hunting seasons and bag limit on each species.

Loss of Habitat

Look around your neighbourhood. What newly built-up areas have replaced a good breeding marsh or a wooded area? Where can the homeless birds go? Is this a serious problem across North America? How can man best manage land to serve the needs of both man and wildlife?

Insecticides

Chemical spraying can spell disaster to birds. One of the biggest problems is a storage or accumulation of poison through the food chain.

The robin eats a worm that has eaten leaf mould from a leaf of an elm tree. The tree may have been sprayed with DDT and the robin suffers the effects of this poison. Similarly, fish store up DDT and other hydrocarbon poisons from insect food they eat. Birds such as the bald eagle and osprey, both fisheaters, are in serious danger; for the past few years they have hatched few young as the eggs are defective and break easily during incubation.

Oil Pollution

1967
Great Britain
Torrey Canyon disaster
off Cornwall, England
—accidental oil spillage
of 107 000 t
—9 000 000 l of
detergent for cleaning
—7 849 birds brought to
shore dead or dying
—less than 400
survived

These are some of the grim facts of the *Torrey Canyon* story. Much of the birds' food supply growing along the beaches and

rock pools was killed by the detergents used to clean up the oil. Oiled birds can be cleaned, then they must be fed and cared for until fresh feathers replace the old damaged feather structure. By this time, their skill to fish may have been lost.

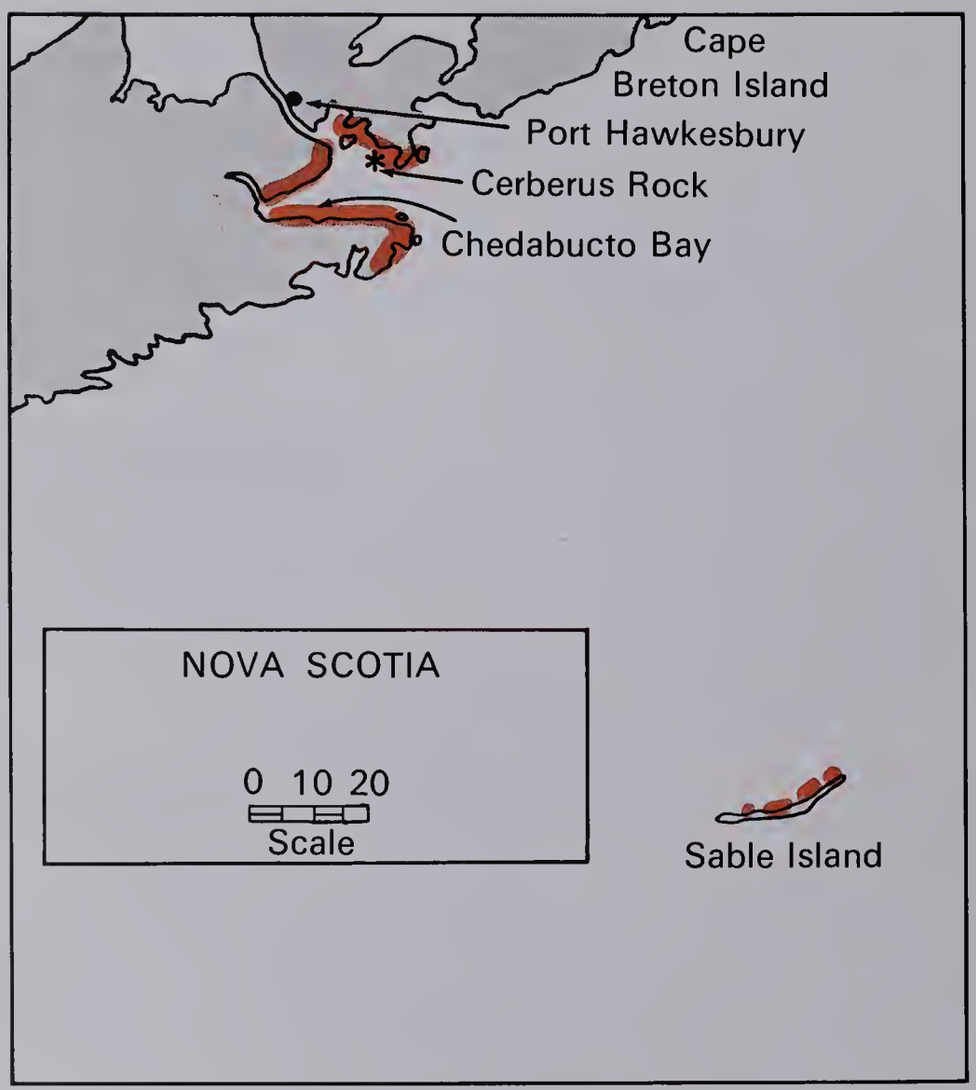
Research these two North American examples of oil pollution.

Chedabucto Bay,
Nova Scotia
Arrow 4 February 1970
Sank with 17 300 000 l oil
8 600 000 l lost, rest recovered
Approx. 2 700 birds
found dead on mainland shores,
3 000 on Sable Island
Cost of clean-up:
$3 000 000

Santa Barbara, California
(offshore leak from well)
28 January, 1969
Severe damage to coastlines
Many birds killed

Disasters such as these make us realize that:

1. governments must make stronger laws to deal with ships which carry large quantities of a dangerous cargo.
2. such regulations must be enforced.
3. ships approaching land must be controlled.
4. research on cleaning methods is urgently needed.


Cape
Breton Island
Port Hawkesbury
Cerberus Rock
Chedabucto Bay
NOVA SCOTIA
0 10 20
Scale
Sable Island

Birds and City Life

Have you ever thought about the special problems facing some birds who live in or near a built-up area? Take a look at the photograph of mother duck. Her youngsters are too tiny to fly, so they have to walk; and if this means crossing a busy, dangerous road, who can help them? Isn't it lucky that a helpful policeman was nearby at just the right moment!

Why do you think this family is so large in comparison to a brood of robins? Where might they be going? Why did the mother decide to move her family?

When this bald eagle's nest was built over 60 years ago, the city was a good distance away. But as the years went by, more and more people moved in and the nest was no longer in a lonely spot. When this picture was taken the adults were caring for young in the nest. A week later tragedy struck: the young eagles were shot while sitting on the nest. The youngsters involved in this crime each received a $10 fine. The double tragedy came the next and succeeding years. The adult eagles returned to the site to lay eggs in the same nest. The eggs did not hatch. Conditions in the river valley below had worsened. Suggest reasons why the eggs were defective and did not hatch. What does this mean about the eagles' position in the food-chain cycle? How can young naturalists help in such a situation?

VALUE OF BIRDS

Are birds worth protecting? Make a detailed flow chart to show all the benefits man receives from birds. Consider these points.

1.	Domestic value	eggs
		meat
2.	Wild fowl	sport
		bird sanctuaries
		insects
3.	Control of	weeds
		rodents
4.	Aesthetic value	sight
		sound

The Boy and the Birds

When Albert Schweitzer was seven or eight years old, he had an experience which impressed him deeply.

He and a friend had made slings out of strips of rubber, with which they could hurl small stones. One Sunday morning his friend said, "Come on, let's go up on the hill and shoot birds".

Albert didn't want to kill anything, but he didn't dare refuse for fear he would be laughed at. The boys came to a bare tree full of birds singing gaily and fearlessly. Motioning for Albert to do as he did, the other boy put a pebble in the leather of his sling and stretched it. Albert obeyed, determined to shoot, although his conscience hurt him badly.

At that very moment the village church bells began to ring, mingling their music with the song of the birds and the sunshine. To Albert it was a voice from heaven, saying clearly, "Thou shalt not kill". He threw his sling down, frightened the birds away to safety, and ran all the way home.

Many years later Schweitzer wrote, "From that day on, I have had the courage to free myself from all fear of man". His long lifetime was devoted to the service of mankind, and his greatest service was putting into words and action the ethic of reverence for life.

Charlotte Baker Montgomery

Dr. Schweitzer was an honorary President of the Kindness Club. This club has a dozen suggestions, which represent one view of how nature should be respected.

Leave all wild animal babies, including birds, where they are in woods or fields. The parents are usually hiding close by or are off searching for food.

Preserve the forest by leaving flowers on their stems, shrubs and trees standing, and by being responsible with fire.

Learn to know snakes. Harmless species far outnumber poisonous ones, and even poisonous snakes bite only if provoked.

Take home empty cans and bottles or leave them in proper containers, thus avoiding the risk of animals getting heads caught in cans or feet cut on broken glass. Remember—animals go barefoot!

Respect and protect homes of animals—dens, nests and food supplies.

Do not *feed animals*. Do not throw food near highways.

Ask drivers to slow down in wooded sections, keeping a sharp eye out, so they may yield to animals their right-of-way.

Get professional help when trying to rescue an injured animal.

Keep pet dogs and cats under control so that they will not chase wild animals.

Prevent pollution of the environment by doing without poison sprays, refusing to throw trash into streams, and speaking out to remind others.

Insist that wildlife refuges be "places where animals are safe or protected"—not shooting galleries.

Hunt with a camera—as YOU would like to be hunted.

"Take nothing but pictures; leave nothing but footprints."

The Kindness Club, 252 Waterloo Row, Fredericton, New Brunswick.

Hope Sawyer Buyukmihci

Appendix

ARTS AND CRAFTS

Mrs. McKenzie's special opportunity class made these attractive bird posters. First they outlined the birds they wanted to make, either freehand or by using the outline thrown by an overhead projector. They then rolled small balls of suitably coloured plasticine, dabbed them in place, and used shellac or hair spray to cover and preserve the finished product.

Below is a close-up photograph of another of the posters.

On pages 88 to 95 are plans from which you can make birdhouses, and here are some actual houses made by pupils. Each of these homes has a floor designed for easy cleaning. By checking the plans, decide which type of floor each house uses.

Design your own birdhouse, remembering the features of a good birdhouse and the special needs of certain birds.

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Nest Scheme addresses

Addresses of Canadian Nest Records Schemes are as follows:

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Redpath Museum,
McGill University,
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Maritimes Nest Records Scheme,
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Newfoundland and Labrador Nest Records Scheme,
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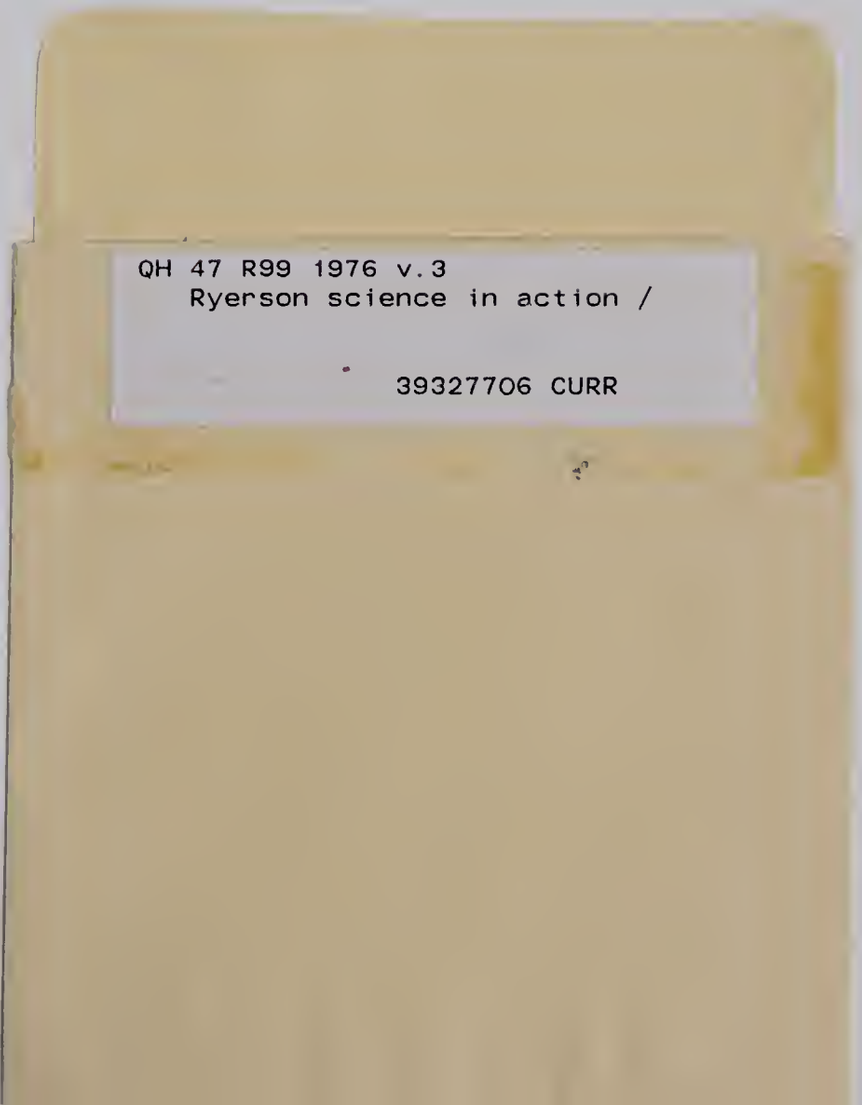

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